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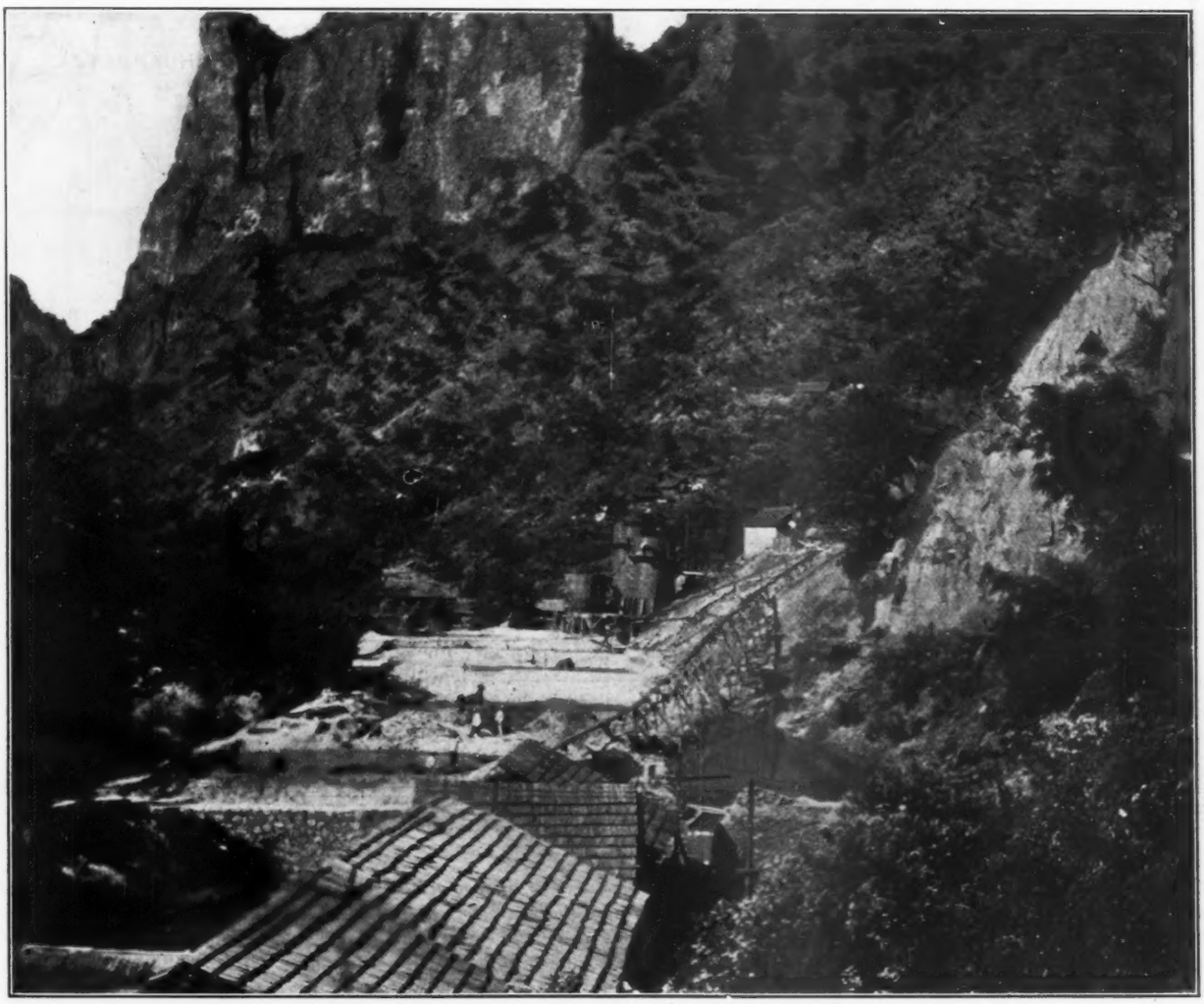
Rio Plata Mine and Mill, Western Chihuahua

The Vein Is Developed by Adit Levels from the Side of a Cañon, and the Ore Is Treated by Sliming and Cyanide Agitation

BY H. J. BARON*

The property of the Rio Plata Mining Company is situated in the Sierra Madre mountains, in the southwestern corner of the state of Chihuahua, about 20 miles from the Sonora and Sinaloa state lines. It is within the Arteaga mining district, municipality of Chinipas, and 6 miles from the old silver camp of Guazapares. It is distant from Chihuahua approximately 285 miles, and from Sánchez, the present terminus of the Kansas City, Mexico & Orient Railway, about 85 miles in a southwesterly direction. For the latter distance there is a good mountain trail. In its progress westward the railroad will pass within 20 miles of the company's Santa Bárbara mine, and this will minimize one of the difficulties attending the equipment and operation of the property.



RIO PLATA MINE, TAILINGS PONDS IN FOREGROUND

The region is extremely rugged, towering mountains and precipitous cañons being features of the 85-mile trail to the camp, as well as of the camp itself. The elevation at the Santa Bárbara mine is 3100 ft. The location is within the rich and proved mineral belt extending north-south about 225 miles and east-west 100 miles, on the western drainage of the Sierra Madre range, and within whose boundaries are included many of the state's most productive mines. Beginning with the Guadalupe y Calvo section on the south and terminating at the Dolores mine at the north, are the Morelos, Batopilas, Urique, Barranca de Cobre, Palmarejo, Uruachic, Jesús Maria, Pinos

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Altos, Concheño, Dios te Guíe, Bufa, Trinidad, República, Mulatos and others of past and present production records. The accompanying map gives the location of most of these mines as well as a good idea of the region's transportation facilities. The present railroad station for camp Rio Plata, Sánchez, is not shown, but it is to the south of Bocoyna at the point designated as "8152 ft., highest point on the Orient Railway."

The Mine

The company's holdings comprise mineral rights to 187 acres and surface rights to 2700 acres of timber and ranch land, all in one tract, together with water rights on the Septentrión river, a stream traversing the property for a distance of 6000 ft., and furnishing excellent power facilities. The mesas within the ranch tract are heavily timbered with pine and oak, the former of long-leaf variety, many of the trees being 3 ft. in diameter. The location of the mineral claims, on both sides of the river and within the ranch tract, is such as to cover every possible dip of the veins. It covers the vein for a distance of 2000 feet.

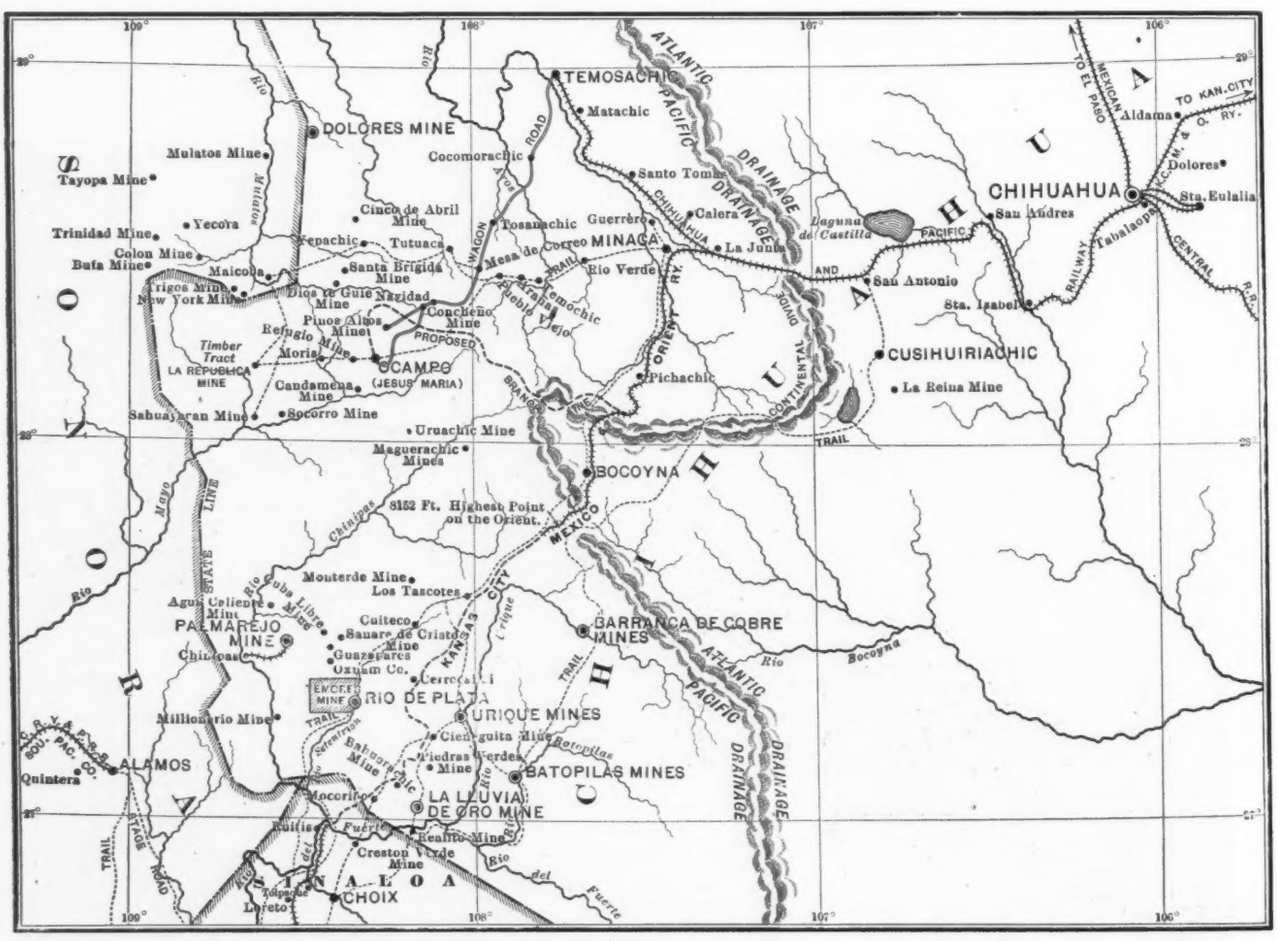
Historically and geologically, as well as topographically, the Santa Bárbara mine presents many interesting features. The mine is *not* an *antigua* with a past record, but is only four years old, now entering upon its earning career. It was formerly owned by Mexican ranchers, who made but one shipment, consisting of 22 tons of ore of a net value of 38,000 pesos. It was acquired by the present company a little more than two years ago, and on terms that almost resulted in its reverting to the original owners. The bond for its purchase required that the mill be placed in operation within six months from the date thereof, under penalty of forfeiture, and notwithstanding serious delays in machinery shipments, the mill was placed in operation on the last day of the prescribed period. At that time the nearest railroad point was 125 miles away, and the trail to the camp was a most difficult one.

The original discovery of the mine was made easy by the eroding cañon, Santa Bárbara by name and through which runs the Septentrión river, which cuts the vein at right angles, exposing it for a depth of nearly 1800 ft., from the top of the mountain to the river bottom.

Nature of the Deposit

The vein is a fissure in diorite, with a course south 25 east and a dip of 17 deg. from the horizontal. Its uniform width is remarkable, the average of that exposed by nature, as well as by the 2500 ft. of workings, being between 4 ft. and 6 ft. In some places, as at the rich outcrop first worked by the Mexicans where faulting is noticeable, its width is as great as 12 ft., while the surrounding country rock to a like distance carries workable material. The richer ore runs in shoots, usually on the hanging-wall side and separated by variable areas of lower-grade ore. These rich shoots vary in width from 1 in. to 12 in. and in value from 200 oz. to 4000 oz. silver to the ton.

The gangue is mainly bluish-colored quartz, an approximate analysis being as follows: silica, 80 per cent.; iron, 6.75; calcite, 2; sulphur, 32; manganese, 0.13; alumina, 5 and magnesium, 2 per cent. The ore carries chiefly silver, which occurs as the sulphide, bromide and native, the predominating occurrences being in the order given.



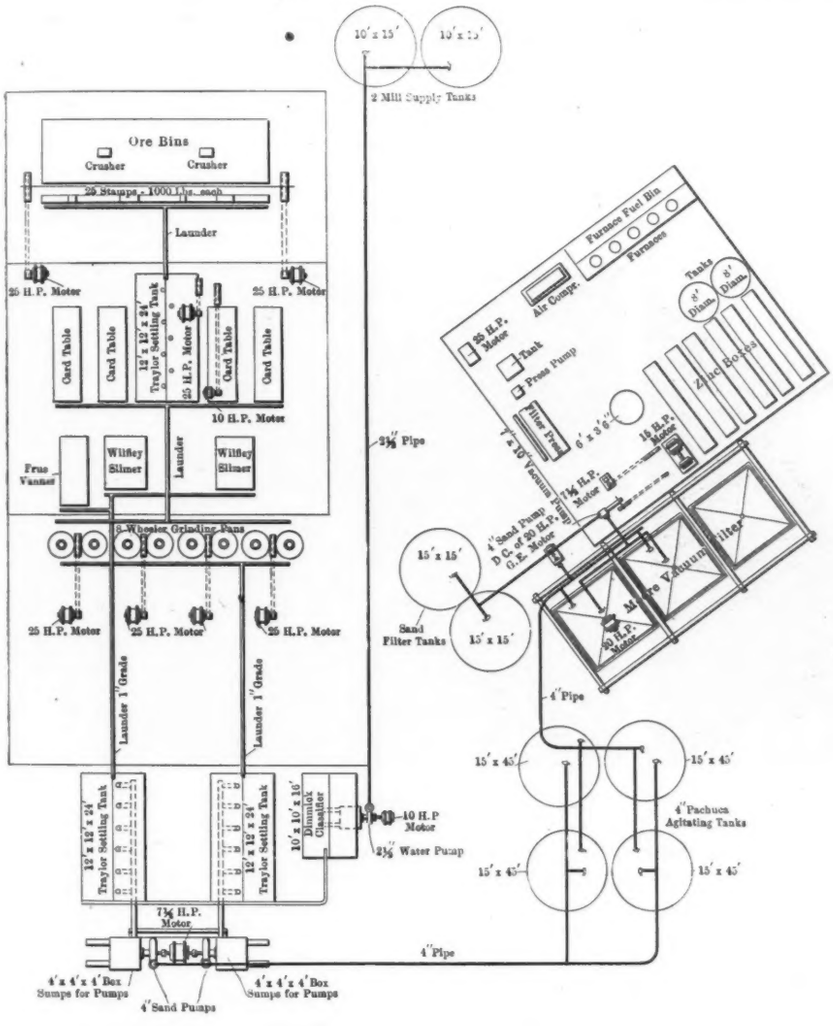
MAP OF SOUTHWESTERN CHIHUAHUA, SHOWING SITUATION OF RIO DE PLATA

more than 2500 ft. in addition to which there are several hundred square feet of stoped areas. The mine is so situated that it is readily exploited by means of short tunnels. The deep cañon has proved superior to a shaft of like depth in exposing the vein for more than 1800 ft., while the precipitous rise of the mountain, in a series of benches, makes economical the driving of adits at depth.

The extent and nature of the development is shown in the accompanying map. The six openings, the five upper of which are connected by winzes and upraises, are as follows: La Obra, 275 ft. in length, driven at a point 60 ft. above the river; San Antonio, or tramway level, 400 ft. long, 200 ft. above La Obra; San Miguel, 350 ft. long, 75 ft. above San Antonio; San Felix, 250 ft. long, 75 ft. above San Miguel; San Gonzalo, 180 ft. long, 85 ft. above San Felix, and San José, 300 ft. long and 100 ft. above San Gonzalo. The San José tunnel is vertically 1100 ft. from the apex of the vein on the mountain top. The San Felix is the original opening and is driven at a point where the Mexicans were able to make a "patio" and where they stripped the vein for 60 ft., to an average depth of 25 ft., in the progress of which the 22 tons of high-grade sulphide ore was mined and shipped. The walls of this pit have since been broken into; samples give assays as high as 1600 oz. per ton.

The workings, all of which are in ore, have demonstrated a remarkable continuity and permanency of the vein, as well as the comparative absence of serious faulting. In driving the lower tunnel some apprehension was first felt concerning the apparent faulting, but this has vanished since the opening up of a 6-ft. orebody in the bottom of a 60-ft. winze sunk from the tramway level above.

Throughout the workings the vein shows an average width of more than 4 ft. and gives evidence of widening as the lower levels are continued. The high-grade shoots of bromides and native silver have been encountered on all levels. The average value of the ore exposed in the various tunnels, winzes and raises is estimated to be 100 oz. silver per ton, while that of the ore hitherto mined is 110 ounces.



FLOW SHEET, CONCENTRATING MILL AND CYANIDE PLANT

Method of Mining

The vein as stoped between the San Miguel and San Conzalo tunnels was 5 ft. in width on the average and in places as great as 12 ft. There has been mined between these levels in an area of 150 sq.ft., about 10,000 tons of 110-oz. ore. The breasts of the several adits as well as the faces of the raises and the bottoms of the winzes are all in ore and there are in reserve large bodies in all of the stopes. Engineers' reports place the value of the ore available from present developments at $2,000,000.

The ore for the entire width of the vein is mined by the overhead stoping method, the vein being well opened up into fairly even blocks by the several levels and winzes. All of the ore is dropped for extraction to the San Antonio or No. 2 tunnel, from which it is trammed in mule cars to the surface. Connections are now in progress between tunnels Nos. 2 (San Antonio) and the Obra by way of the winze from the former, and a 15-h.p. Girard hoist is installed in the tramway or San Antonio level for the hoisting all ore mined below that level.

The vein walls are throughout remarkably firm, regular and smooth, causing the ore to break away readily. No timbering other than an occasional stull is required. Nor is any provision for caring for water necessary; the workings are perfectly dry, with the exception of the lowest tunnel where the flow is about 2 gal. per minute. That the mine will continue dry seems assured, inasmuch as La Obra tunnel is at least 40 ft. above the highest known water mark of the river. The various connections between levels have up to date provided natural ventilation, which will probably be adequate for an indefinite period, under the blocking-out system of mining followed.

In ground-breaking hand drills only are used at present, but on the completion of the power plant electrically driven air drills will be substituted. The only sorting resorted to is the separation of the ore in the high-grade shoots, this separation being done in part in the breaking and in part by hand selection underground and at the surface. The amount of this high-grade ore of an average value of 1800 oz. silver secured is from 5 to 15 tons monthly. The daily tonnage of the mine now is about 60 tons, while the development work of the month totals about 200 feet.

The Milling Plant

From the main working tunnel to the mill, a distance of 1400 ft., the ore is transported in cars of 1000 lb. capacity, drawn by mules, one mule pulling a train of six cars. Electric haulage, both underground and on the surface, will later be used. One of the accompanying photographs shows the present concentrating mill and the cyanide plant now in process

of construction. Another shows the accumulated tailings and reservoir.

The cyanide plant will employ the all-sliming process, but on lines somewhat different from those ordinarily followed in the cyanidation of Mexican silver ores. The method was worked out by the company. The tests on a working scale have been very encouraging. The cyanide annex is expected to be in operation early in 1909.

The concentrating mill is a frame structure, built on the slope of the mountainside, so as to permit of gravity flow of material throughout. It has an equipment of 25 stamps and the necessary concentrators, pans, settlers, etc., to afford a daily capacity of 60 tons, while the cyanide plant is being built for handling 100 tons of accumulated and current tailings.

The ore is dropped from the cars into ore bins of 200-ton capacity, through 8x10 ft. grizzlies of about 1½-in. openings, the oversize from the grizzlies going to two rock breakers, of jaw type and Wheeler pattern, set to crush to less than 1¼ in. Plunger feeders facilitate delivery to the batteries, which include five stands of five stamps each. The stamps weigh 1000 lb. and drop 6 in. at the rate of 108 drops per minute. The cam shaft is 6 in. in diameter. The battery screens of 24 mesh are of the Tyler woven-wire type. The mortars are of the sectionalized type made by the Compañia Industrial Mexicana of Chihuahua; they are of straight-back, high-feed pattern with screen space 13 in. wide; they weigh, without the steel housings, about 3000 lb., but for mule-back transportation are built so that the heaviest piece is less than 300 pounds.

RIO PLATA MILL

NATURAL DIVERTING WALL, INTAKE DAM

Methods of Treatment

Crushing is performed in 0.1 per cent. cyanide solution. The battery pulp goes to a Traylor settling tank, 12x12x24 ft., of V-shape, from which the heavier material is drawn off at the bottom to Card tables, five in number, while the overflow, together with the table slimes, is launder-delivered to two Wilfley slimers and one Frue vanner. Concentrates are made over both the Card tables and sliming machines and the tailings from the former are sent by launder to eight Wheeler grinding pans of 5 ft. diameter for regrinding to about 150 mesh, from which the material is delivered by gravity launder to two Traylor settling tanks, of capacity and type as the one earlier noted. The overflow from the settling tanks goes to a 10x10x16-ft. Dimmick classifier; the clarified water from the classifier is returned by 2½-in. pump through a 2½-in. iron pipe, 162 ft. long, to the mill-supply tanks of 10x15 ft. dimensions, placed outside and at the head of the battery room.

From the settling tanks the pulp is delivered through a 4-in. iron pipe to four Pachuca agitating tanks 15 ft. in diameter and 45 ft. deep. These tanks, as is the case with all of the others in and about the reduction plant, are constructed of 3/16-in. steel. The pulp will be agitated 12 hours in 0.25-per cent. cyanide solution. After agitation, the pulp will be drawn off through a 4-in. pipe to the Moore vacuum filter press having 28 leaves, 6x10 ft., affording 100 tons capacity. The solution from the press is to be pumped to two 15x15-ft. sand-filter tanks, from which it will be drawn off to six 10-compartment zinc boxes. In precipitation, fine zinc shavings will be used, and the precipitates are to be filter-pressed before going to the retorting furnace in the melting room adjoining.

Motors and Equipment

The milling plant is driven by General Electric motors throughout. One 25-h.p. motor, of 600 r.p.m. constant speed, operates the crushers and two of like power and speed drive the stamps; one 10-h.p. motor, of variable speed, operates the concentrators and slimers and another of 25-h.p. variable speed drives the compressor for air agitation in the tanks; the eight Wheeler regrinding pans are driven by four 25-h.p. constant-speed motors, one motor to every two pans; one of 10-h.p. operates the 2½-in. pump which returns the water to the mill-supply tanks; one 20-h.p. motor runs the Moore vacuum filter while the 4-in. sand pump is operated by a 20-h.p. motor and the 7x10-in. vacuum pump is driven by a 15-h.p. motor, while one of 2½-h.p. operates the precipitate filter press. For a reserve pump set in the furnace room a 25-h.p. variable-speed motor is installed.

The milling machinery was furnished by the John A. Traylor Machinery Company, of Denver, and the Compañia Industrial Mexicana, of Chihuahua. The steel tanks were built by the El Paso Foundry and Machinery Company, of El Paso.

Concentration is at the ratio of 30 to 1, and very rich concentrates, containing about 50 per cent. of the value of the ore, are turned out, the mixed concentrate products from the tables and slimers averaging 1500 oz. silver per ton. The gold contents of the concentrates are only about 1 oz. to every four tons.

In the milling operations thus far carried on there has accumulated approximately 11,000 tons of tailings of an average value of 51 oz. silver. The tests have demonstrated a probable working extraction by cyanidation of 86 per cent. of this silver, by grinding to 150 mesh and treatment in 0.25-per cent. solution, with a cyanide consumption of about 5.6 lb. to the ton of tailings. The total extraction by concentration and cyanidation will, therefore, probably be more than 93 per cent. of the assay values of the ore.

The Power Plant

The abundant water supply from the Septentrión river has been utilized in the generation of electric power. At the mine

the stream has an actual fall of 205 ft. in 5000 ft., and at one place back of the camp there is one waterfall which is about 1200 ft. high during the rainy season. The water, taken from the river at a point 4000 ft. from the mill, is delivered to the storage reservoir in a wooden flume 5300 ft. long. The flume is 20 in. deep and 40 in. wide, and is constructed of 2-in. pine planking.

The in-take dam is at a bend in the stream where a 20-ft. rock face makes a natural diverting wall. For a space of 25 ft. square the uneven river bottom has been rock-floored and cemented to insure better storage. At approximately right angles to the diverting wall there is a 25-ft. face of vertical cliff which has been tunneled for a distance of 150 ft. for carrying the water to the flume system. The natural diverting wall and rock tunnel are shown in an accompanying illustration.

With a flow of 1200 ft. per minute and under a head of 163 ft., the water is delivered to the 6-ft. Pelton wheel, which drives, by means of belt connections, the two 100-kw. General Electric generators, of alternating current, 60-cycle, 480-volt type. This power, 266 h.p., is adequate for present purposes. It will not be difficult at any time, with the abundant water supply, to increase the capacity of the plant, if occasion arises. The present power is utilized in driving the mine and mill machinery. Another Pelton wheel 2 ft. in diameter drives a 25-h.p. General Electric generator which runs the electric-light plant of 150 lights. The cost of power is estimated at 20 pesos per horsepower-year.

Operating Costs

The operating costs at a point so far removed from railroad transportation are necessarliy high. Mining costs are given as 3.70 pesos for ore breaking and sorting, and 24 centavos for tramming, or a total of 3.94 pesos per ton of ore mined. The development costs are 12.34 pesos per foot of ground broken, the Mexican drillers being paid at the rate of 40 centavos per foot drilled. The cost of concentrating is 1.74 pesos per ton of ore treated while the cyanidation costs are estimated at about 4 pesos per ton. Mexican labor is employed, there being but six white men all told at the mine. Peon laborers, of which there is in the region an abundance of more than average efficiency, are paid at the rate of 1.50 pesos per day of 10 hours. The drillers alone work by the piece.

The freighting expenses from Sánchez on the railroad to the camp are as follows: Ordinary freight, 12 pesos per *carga* of 300 lb.; steel tanks, sectionalized, and similar articles, 15 pesos per *carga* of 300 lb. The cost of delivering ore and concentrates to the railroad is 12 pesos per 300 lb., or 80 pesos per ton, while from Sánchez to El Paso, Texas, the railroad freight is 10 pesos per ton, making the total cost of delivery of product to the smelter 90 pesos per ton. Twenty-two days are required for a round trip of the freighters to the railroad.

The Camp and Organization

The camp is picturesquely situated in the cañon between the mine and mill. The buildings, numbering five and substantially built of adobe, comprise a large boarding house, store, warehouse, assay office and officers' quarters. There is also a settlement of 400 Mexicans nearby. There are telephone and telegraph connections to the mine. The operating force at the mine numbers about 125. The superintendent in charge is H. W. Edmondson.

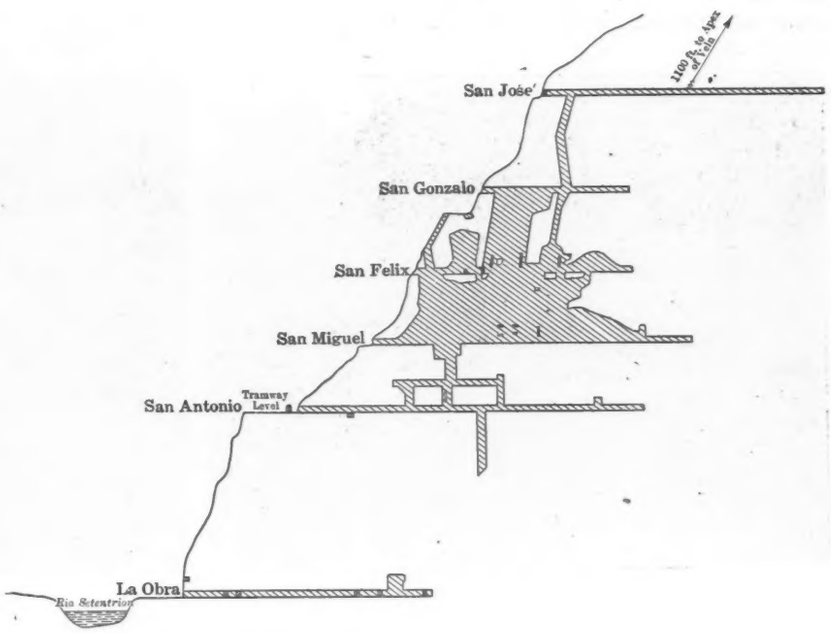
The Rio Plata Mining Company is capitalized at $2,000,000, the largest holders of the stock being a few New York capitalists. The officers of the company are as follows: President, H. W. Miller; vice-president, A. B. Cordner; and secretary-treasurer, John L. Toppin. These gentlemen and nine others, including D. W. Shanks, of Los Angeles, comprise the directorate. Mr. Shanks is also general manager, with offices at Chihuahua.

A suction gas-producer system is used at the New Chums Goldfield mine, Bendigo, Australia, for running the mill. Formerly the cost of steam power generated by burning wood was, according to Donald Clark, *Aust. Min. Stand.*, Sept. 23, 1908, 1s. 3.5d. per ton of ore crushed. During the short time that the gas-producer system has been running the cost of power has been 3.18d. per ton of ore crushed.

Mexico's New Mining Law

The new mining law of Mexico consists of 150 articles embodying the present laws and the decrees and regulations that have been in force, with some important changes, mostly with the view of removing conflicting legal provisions. The regulation as to pertenencias remains unchanged. Article 3 provides that matters relating to mining property shall be subject to the civil code of the federal district, except when specifically determined otherwise in the law itself.

The provisions relating to the restriction of mining rights to Mexican companies is absent from the draft submitted; and the restrictions which required the foreigner to secure executive permission to locate claims in the border states is made to apply only to an 80-kilometer zone on the boundaries. The law will become effective July 1, 1909, except that the provisions as to prospecting permits become effective after the promulgation of the law.



SANTA BARBARA MINE, RIO PLATA MINING COMPANY

Bismuth

The price for bismuth which was established by the European combination at 6s. 6d. per lb. on July 4, 1907, remained at that price throughout 1908. As in 1907 a small amount of refined bismuth was produced in the United States, but the production is still too insignificant to have any effect upon the price or even to attract the attention of the combination.

Diamond Mine in Pike County, Arkansas

The Gems Are Found in Peridotite Which Is Similar in Every Essential to the Diamond-Bearing Formations of South Africa

BY JOHN T. FULLER*

It is now nearly two years since the first rumors of the discovery of diamonds in their original matrix in Pike county, Arkansas, began to reach the East. This discovery has since been verified by competent engineers and geologists, and active preparations are being made to develop the field on an extensive scale.

It has long been a well known fact that genuine diamonds have been found from time to time on the continent of North America chiefly within the boundaries of the United States. Dr. George F. Kunz is authority for the statement that the first authentic find of a diamond in the United States was in 1832 in the State of Indiana. Since that time a number of authenticated finds of diamonds have been made in several States of the Union, among which may be mentioned Virginia, North Carolina, Georgia, California, Idaho, Montana, Indiana, Arizona, Michigan, Wisconsin and Ohio. It is to be noted that in all these cases the discovery was confined to either one, or a few scattered stones, and in no case has the locality where these diamonds originated been discovered.

Attempts have been made to trace the diamonds found in the glacial drifts of Michigan, Wisconsin, and Ohio back to their original source, which is supposed to exist somewhere in Canada, but so far without success. The discovery in Arkansas, therefore, is the first locality, not only in the United States, but also on the Western Hemisphere, where diamonds have been found in their original matrix.[1]

*Consulting engineer, Wilkes-Barre, Penn.

Locality and History

The exact location of this Arkansas discovery is Pike county, Sections 21 and 28, Township 8 South, Range 25 West. The diamond-bearing area lies on the east bank of the Little Missouri river near the junction of that stream with Prairie creek. The nearest town is Murfreesboro, the county seat, which is about 2½ miles to the northwest.

Direct rail communication to Murfreesboro will be established in the near future by a branch line which will connect with the main line of the Kansas City Southern at Ashdown, Arkansas. At present the easiest way to reach the property is by rail from Little Rock to Cooley's Crossing, via Prescott, which is about 6½ miles from Murfreesboro, the latter distance being covered by wagon.

The history of this Arkansas discovery presents several interesting features. First mention of this locality was made as early as 1842, but no report of any accuracy was made until 1890, when the region, including the volcanic area, was mapped and reported on by John C Branner, who at that time was State geologist.[2]

In this report Branner mentions that the rock resembled closely the diamond-bearing rocks of South Africa, but scouts the idea of its containing diamonds, due to the absence of any bituminous shales surrounding the "pipe," or crater, such as occur about the pipes at Kimberley, and from which it was at that time supposed that the carbon required for the formation of the diamond was derived.

No more notice was taken of this area until 1906 when John M. Huddleston, who had in the meantime purchased the property on which the greater part of the diamond area lies, found the first diamond on Aug. 1, 1906. This was a white stone of 4½ carats. On the afternoon of the same day a second diamond was found by Mr. Huddleston, who, suspecting that he had found something valuable, although he did not know just what, sent the stones to C. S. Stifft, a jeweler of Little Rock, who pronounced them to be true diamonds.

Mr. Stifft, realizing how important was this discovery, immediately, with several friends who joined him as partners, secured options on the Huddleston tract and on considerable other land adjoining, thus gaining control of by far the greater part of the igneous area. The company thus provisionally formed secured the services of competent geological and engineering advice, and on the strength of the reports made to them, a company, known as the Arkansas Diamond Company, was incorporated for the pur-

POINT AT WHICH FIRST DIAMOND WAS FOUND

PERIDOTITE OUTCROP ON SOUTH SLOPE

[1] Diamonds have never been found in South America in the true matrix.

[2] Geological Survey of Arkansas, Annual Report for 1890.

pose of mining diamonds on a large scale.

Geology

The matrix of the diamond is a peridotite which has been described by the late Prof. Henry Carvill Lewis as "a porphyritic volcanic peridotite of basaltic structure," which is named kimberlite.[3] This peridotite, or kimberlite, is more popularly known in South Africa as "blue ground."

The use of the term blue ground in connection with this rock is very misleading. Many people are deceived by this term and take it for granted that the diamonds occur in a soft clay soil, or ground which presents no difficulty, or much expense to wash and concentrate. This is not the case. The origin of the term blue ground is interesting. Like most peridotites the greater number of the "diamond-bearing peridotites" show marked changes on exposure to the atmosphere and "weather in place" to considerable depth.

known as a "pipe," which is the neck, vent, or stock, of an old volcano, or dike, filled up solid with the diamond-bearing rock and extending to unknown depth. The Arkansas peroditite has been demonstrated to be in every essential similar to the diamond-bearing peridotites of South Africa, and the most essential characteristic, the actual finding of diamonds within its mass, is fulfilled.

Varieties of Peridotites

I have heard it said, and seen it written, that this Arkansas peridotite shows marked differences from the peridotite of Africa. When it is realized that from the same pipe in Africa a dozen or more different hand specimens of peridotite can be taken, no two of which resemble each other either in inclusions or physical appearance, the folly of attempting to find differences in this Arkansas pipe from hand specimens brought from the African pipes, is evident. The only way they can

The harder varieties of the peridotite, which may and do occur in the same pipe with the softer variety and which are known as "hardibank," are of an entirely different nature. No amount of exposure to the atmosphere will have any practical effect on this rock. In hardness it is equal to the hardest quartzites, and to be concentrated at all, it must first be crushed by powerful crushers. This variety does not weather in place to any extent and forms the hard outcrop which first drew the attention of geologists to the Arkansas pipe.

The concentrate from this diamond-bearing peridotite contains many other minerals besides the diamond, among which may be mentioned mica, hornblende, magnetite, olivine, garnet, etc. In no instance have these minerals, or any other mineral except the diamond, been found in the diamond-bearing peridotite of such quality as to have any commercial value. There is no commercial

FIRST PIT SUNK IN PERIDOTITE

PART OF DIAMOND-BEARING AREA

The fresh peridotite is as a rule of a bluish green color, which changes on weathering to a dull grayish green or yellowish green. During the process of weathering, the rock disintegrates to a great degree and can easily be pulverized between the fingers. It is then, properly speaking, when in this condition, a "ground" and not a rock. This yellow disintegrated peridotite being naturally the top portion of the mass was the rock in which the diamonds were first found and became known as "yellow ground." In time the yellow ground was mined out exposing the hard undecomposed blue peridotite beneath, which was called in contra-distinction by the early miners blue ground.

The diamond-bearing peridotites of South Africa occur in what is there locally

be compared is to compare the masses as a whole, and by this method of comparison I can see no radical difference either in formation, occurrence or in the character of this peridotite from those of South Africa.

That the Arkansas peridotite occurs in a pipe similar to its occurrences in South Africa has also been sufficiently demonstrated, by means of bore holes, to be accepted as a fact. The peridotite of the Arkansas pipe, as is also true of the South African pipes, varies considerably in hardness over different parts of the pipe. In most cases the peridotite will disintegrate readily after a few months' exposure to the atmosphere. The softer varieties, which are comparable in hardness when fresh with ordinary sandstones, "weather in place" to depths varying from 20 to 60 ft. and form the famous "yellow ground" of the South African mines.

by-product from the mining of diamonds.

Inclosing Rocks

In the nature of the surrounding rock strata the Arkansas pipe differs considerably from those occurring near Kimberley, but it resembles many of the pipes found elsewhere in South Africa. So far as known at present the rock strata surrounding the Arkansas pipe are Carboniferous sandstones, and quartzites, unconformably overlaid by horizontally-bedded Cretaceous sandstones, which are in turn overlaid by a coarse Post-Tertiary conglomerate.

In two places within the peridotite area can be seen the outcrop of a dike of volcanic rock from 5 to 6 ft. wide and of a light blue color. This dike cuts through the peridotite with a strike nearly east and west. It is most probable that this

[3]Eighteenth Annual Report, De Beers Consolidated Mines.

dike rock contains no diamonds and that it will be found on further excavation to be of a similar nature to the barren dikes and floating reefs, which occur in the mines at Kimberley.

There is a second small dike about 12 in. wide exposed in Prairie creek at the point where that stream empties into the Little Missouri river. This dike is undoubtedly peridotite and will no doubt be found to join the main body of peridotite at some point which future excavation will disclose.

It may be remarked that the South African pipes have many of these small dikes radiating from them which lead nowhere in particular and which pinch out entirely a short distance from the pipe.

Genesis of the Diamond

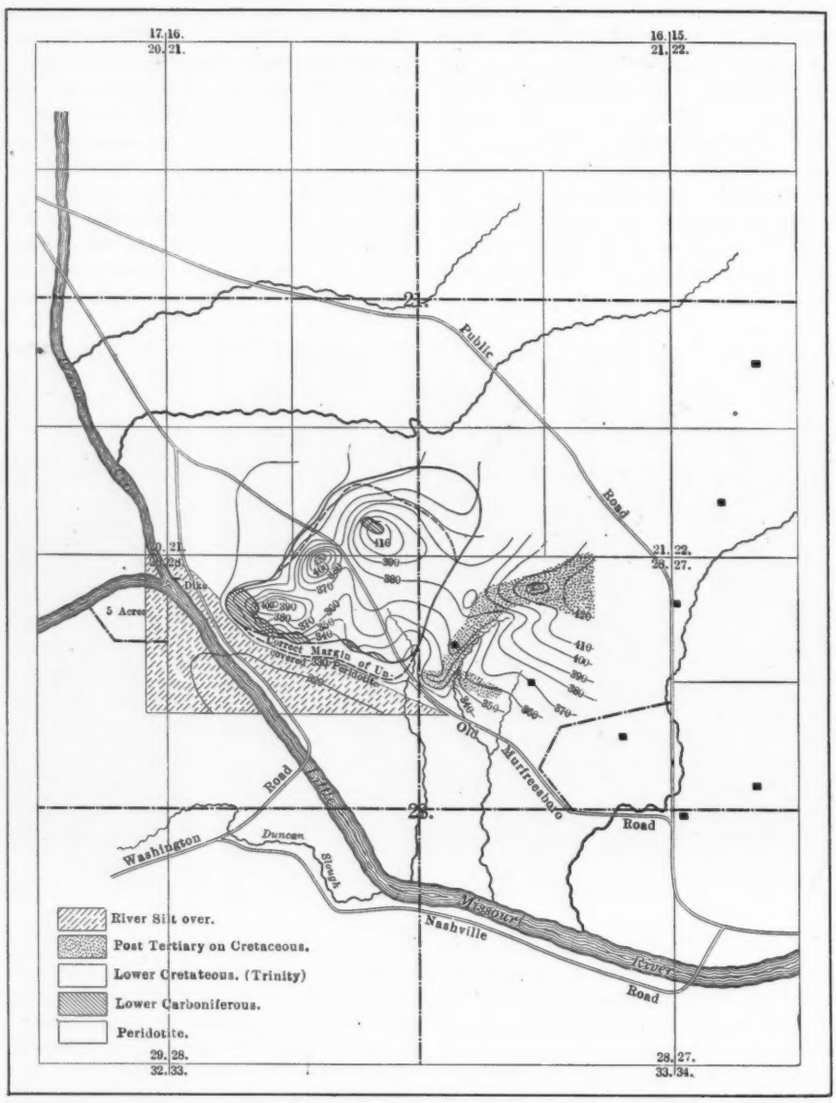
Many theories have been advanced and are constantly being advanced to account for the presence or formation of diamonds within these igneous masses of peridotite. It is not within the scope of this article to go into detail with regard to these theories. When it is remembered that we have several hundred of these peridotite pipes in Africa in all of which the peridotites are essentially the same, but in the great majority of which either no diamonds occur at all or so few diamonds occur as to make their recovery unprofitable, one is apt to come to the conclusion that diamonds, like gold, are wherever you find them. One has only to read the chapter on "The Formation of the Diamond" in "The Diamond Mines of South Africa," by Gardner Williams, to come to the conclusion that no one knows, or probably ever will know, just how or where nature has formed the diamond.

The Arkansas Diamond Area

The roughly elliptical area shown in the accompanying map represents as accurately as can be shown at present the peridotite pipe. The major axis which lies in the northeast-southwest direction, is about 2400 ft., while the minor axis is about 1800 ft. The area covered is approximately 60 acres. On a line which lies practically through the three hills shown and which are known as the West, Middle and East hills, are the outcroppings of the hard peridotite referred to as hardibank.

To the south of these hills the ground falls away gradually to the Little Missouri river. This south slope on the volcanic area is composed of a much softer peridotite than that of the hills. It has here weathered in place to a depth which may reach 60 ft., and is known to be weathered for at least 20 ft. This portion of the area which is also the largest portion, being at least 35 acres in extent, can be excavated easily without or with a minimum use of explosives to a depth of at least 20 ft. I estimate that there is at least 1,500,000 cu.yd. of this material that can be easily and cheaply mined.

Overlying the greater part of the whole area to a depth which does not exceed 1 ft., is a black vegetable soil locally known as "gumbo." This soil contains some peridotite and a mixture of other rocks and soils brought in by the surface waters. A number of diamonds have been found in this soil which were undoubtedly derived from the underlying peridotite.



THE ARKANSAS DIAMOND AREA

In several places of the pipe area, especially on the three hills, there is a considerable growth of pine and oak timber. The pipe lies in a hilly and broken country intersected by many streams and creeks. The soil in the river and creek bottoms is fertile and the climate healthful.

Operations

The operations to date have consisted chiefly of haphazard experimental tests of the peridotite from various places on the pipe. These tests were roughly made with inadequate washing machines, and the chances are that as many diamonds were lost in the tailings as were recovered.

Considerable work has been done in the way of clearing up the area of stumps and gumbo and plowing loose the weathered peridotite. During these operations a large number of diamonds were picked up by chance by the workmen. The number of diamonds found in this way is remarkable and is an indication of considerable richness.

Bore Holes

Three bore holes have been put down with a diamond drill on the pipe area to depths of 79, 184 and 205 ft. These holes are in the peridotite for the entire distance sunk and the peridotite continues beyond the bottoms of these holes to an unknown depth. One of the pipes at Kimberley has been developed down to 3000 ft. with no exhaustion of deposit in sight.

All work on the property is at present suspended until such time as a complete

mining, washing and concentrating plant can be designed and erected, when mining on a large scale will be undertaken.

Diamonds Produced

The total number of diamonds recovered from this area to date by chance finds or concentration is 540. Of these 540 stones 505 weighed 217 carats, or an average of nearly ½ carat per stone. The largest stone so far found weighs 6½ carats. Most of the stones found are white, while a few are yellow or brown.

A large number of these stones are of good water and of remarkable purity, many being of finer quality than African stones. Three of the stones found have been cut and have yielded beautiful gems which have been valued at from $60 to $175 per carat, with an average value for the three cut stones of $104 per carat.

Taking a parcel of rough, unsorted stones from this pipe it will easily average $10 or more per carat in value at the present prices of diamonds. This average equals the average of several of the large producing mines of Africa.

Conclusion

The engineer who is called upon to report on an undeveloped diamond mine, or property, has the serious obstacle to confront that he can make no definite statements or figures as to what average values may be expected from the working of same. It is impossible to make assays of a diamond mine. Bore holes give only indication of the nature of the peridotite and tell nothing of its richness.

The only way that a definite statement of values can be made is actually to mine, wash and concentrate at least 50,000 cu.yd. of the rock. The greater the amount the more accurate will be the result. Test runs from certain parts of the Arkansas pipe indicate at least 0.21 carats per load of 16 cu.ft., which may be considered a most excellent average if it can be maintained.

In many ways the Arkansas pipe has decided advantages over the South African mines. There is an abundant and nearby supply of water and timber. Fuel and mining supplies are comparatively cheap. Mining should be done here at a cost which would be unattainable in Africa.

WEIGHT IN CARATS AND COLOR OF THE FIRST 75 DIAMONDS FOUND IN THE ARKANSAS FIELD.

No.	Weight.	Color.
1	2⅛–⅜	White
2	2⅛–⅛	Light brown
3	2 1/16–⅛	White
4	1⅛–⅛	White
5	1 1/16–⅛	Crystal white
6	1–⅜	White
7	1–⅜–⅛	White
8	1	White
9	1–⅛	White
10	1–⅜	Light brown
11	1	Yellow
12	1	Yellow
13	1	Cloudy brown
14	1	Cloudy white
15	1–⅜	Dark brown
16	1–1/16–⅛	Bort
17	1–⅛	Light yellow
18	1–⅛	White
19	1–⅛	Crystal
20	1–⅜	Light brown
21	⅞	Light brown
22	About ½	Yellow
23	⅞	White
24	⅞–1/16–⅛	Silver cape
25	⅞	Crystal
26	⅞	Crystal
27	⅞–1/16–⅜	Yellow
28	⅞–⅛	Light yellow
29	⅞–⅛	Yellow
30	⅞	White
31	⅞	White
32	⅞–⅜	White
33	⅞–⅛	White
34	⅞–⅛	White
35	⅝	White
36	⅝–⅛	White
37	⅝	White
38	⅝–⅛	White
39	⅝–⅛	Brown
40	⅝–⅛	Brown
41	⅝–⅛	Green yellow
42	⅝–⅛	Brown, found in screen wash
43	½	White, found in dry wash
44	Diamond in rock.	
45	4⅛–⅜	Perfect blue
46	2⅛–⅛	Crystal
47	2⅛	Brown
48	⅜–⅛	White
49	⅜–⅛	White
50	⅜–⅛	White
51	⅜	White
52	⅜–⅛	White
53	⅜	White
54	⅜	White
55	⅜	White
56	⅜	White
57	⅜	White
58	⅜	Yellow
59	⅛	Yellow
60	⅛	Yellow
61	⅛–⅛	Brown
62	⅛	Brown
63	⅛–⅛	Brown
64	⅛	Brown
65	⅛–⅜	Brown
66	⅛	Brown
67		
68	3 3/16–⅛ (are diamonds found in two pieces.) 1⅛–⅛	Brown
69	⅛–⅜	Brown
70 to 75	6 pieces bort. Total weight 2½ carats.	

Volumetric Determination of Uranium and Vanadium

W. D. Engle, in the *Western Chemist and Metallurgist*, November, 1908, describes a method for the determination of uranium and vanadium which is a combination of Sutton's method and that of other authorities. From 0.5 to 2 grams of the material is taken as a sample, the quantity depending on the amount of uranium present which, if more than 0.25 gram, filtering and washing the uranyl ammonium phosphate will be difficult. The weighed sample is transferred to a ¼-liter flask and, treated with 20 c.c of dilute sulphuric acid (1:5) and evaporated to fumes of sulphuric trioxide. Organic matter may be removed by the use of nitric acid with the sulphuric acid.

After cooling and diluting to 100 c.c., 3 c.c. of hydrogen dioxide are added to oxidize the uranium and vanadium. An excess of sodium or ammonium carbonate is next added and the mixture boiled a few minutes, partially cooled, filtered and washed. It will generally be necessary to redissolve the precipitated iron, etc., with dilute sulphuric acid and to repeat the treatment with sodium or ammonium carbonate, combining the filtrates and wash waters. Care at this stage must be used to keep the solution oxidized by the use of hydrogen dioxide.

The combined filtrates and wash waters are made acid with sulphuric acid and ammonium phosphate is added (0.5 to 1 gram). The solution is boiled vigorously to expel the carbon dioxide and made alkaline with ammonia. The thorough removal of the former is essential as the uranyl ammonium phosphate is soluble in ammonium carbonate. This difficulty is in part overcome by boiling the mixture after the addition of the ammonia until the solution has a slight acid reaction, or by the addition of acetic acid.

The uranyl ammonium phosphate must not be filtered from an alkaline solution, as a part of the uranium will probably remain in the solution. With these precautions the uranyl ammonium phosphate may be filtered and washed. Washing with an ammonium-sulphate solution (1:25) helps to prevent the carrying through of the precipitate in the colloidal form.

If the amount of the uranium is very small, a small amount of aluminum sulphate may be added to aid in the filtration and to prevent portions of the uranium from being carried through the paper.

The filtrate, which contains the vanadium, is treated with 10 c.c. of strong sulphuric acid and 2 grams of sodium sulphite. The excess of sulphur dioxide is boiled off, and the solution immediately titrated, hot, with permanganate solution. A twentieth-normal permanganate is recommended rather than a stronger solution. The iron factor of the permanganate multiplied by 0.9159 gives the vanadium factor, or by 1.631 gives the V_2O_5 factor.

The uranyl ammonium phosphate is dissolved with dilute sulphuric acid, granulated zinc of known purity is added and the reduction continued for 45 minutes. The solution is decanted from the zinc and the zinc washed. The solution with the wash waters is titrated with the permanganate solution. It is important that this be not stronger than twentieth-normal, as the atomic weight of uranium is so great that it gives a large factor for the permanganate. The iron factor of the permanganate multiplied by 2.133 gives the factor for uranium, or multiplied by 2.5167 gives the factor for U_3O_8.

This method, says the author, has been checked against pure uranium and vanadium salts with satisfactory results. None of the elements commonly found in ores interferes with it. The method has been repeatedly checked by the gravimetric methods with results that agree closely, and the saving of time is considerable.

New 506-ft. Chimney at Great Falls Smelter

The Largest Chimney, Both in Size and Capacity, in the World; Flue Dust Caught by Network of Wire Suspended in Dust Chamber

BY EDWIN HIGGINS

The new chimney at the Great Falls smelter of the Boston & Montana Consolidated Copper and Silver Mining Company was topped out Oct. 23, 1908. This chimney is 506 ft. in hight above the foundation and is the largest, both in size and capacity, in the world. The smelter, shown in plan in Fig. 1, is situated on the north bank of the Missouri river, about three miles from Great Falls, Mont. The plant, which consists of reverberatory and blast furnaces, McDougal roasters and converters, has a capacity of 4500 tons of ore per day.

Additions made to the plant in recent years have increased the production of furnace gases, so that at times as much as 2,000,000 cu.ft. of gases per min. are made. The old chimney is situated about 1500 ft. back of the plant, and the gases were led to it through large masonry flues buried to the level of the intervening ground. This chimney is 20 ft. in diameter and 185 ft. above ground; being situated on a slope rising gently from the smelter site, its top is about 400 ft. above the level of the blast-furnace floor. Under ordinary conditions its capacity is only about 700,000 cu.ft. of gases per min. This lack of capacity in the old chimney at times caused a serious loss in flue dust; moreover, its brick and mortar construction had exposed it to the action of the acids which formed in wet weather. In consequence of this its interior was badly eaten and disintegrated. Accordingly it was decided to build a new system of flues and a new chimney, the latter to have a capacity of 4,000,000 cu.ft. of gases per min. at a temperature of 600 deg. Fahrenheit.

Site and Foundation

The site chosen for the new chimney was 2000 ft. back of the furnace plant, the elevation here being 246 ft. above the charging floor of the furnaces.

It was first determined to excavate to a depth of 30 ft. for the foundation, but when 22½ ft. of depth had been attained, it was determined by tests that it was unnecessary to go deeper. The ground in which the excavation was made is hard shale. The foundation consists of an annular mass, the circular inner edge of which is 47 ft. in diameter at the bottom and the octagonal outer boundary 103 ft. across flats at the footing level, tapering to 64 and 81 ft. diameters at the top of the concrete. The foundation was constructed of 1:3:5 slag concrete. The sand and stone were obtained from the smelter furnaces. In the work of construction 5200 bbl. of cement, 2000 cu.yd. of sand and 4000 cu.yd. of slag were used; the cost of materials and construction was in the neighborhood of $50,000. Fig. 2 shows the completed foundation. Fig. 3 shows the first 25 ft. of the chimney, and two of the flue openings.

The Chimney

The chimney proper has an octagonal base 46 ft. high with a taper of 8 per cent. Above this point the section is circular, the first 180 ft. above the base having a taper of 7 per cent., the next 100 ft. 4 per cent., and the remaining 180 ft. 2 per cent.

The chimney was built in 23 sections; 19 of these are above the octagonal base. The thickness of the chimney wall varies from 66 in. at the base to 18⅛ in. at the top. The outside diameter at the base is 78½ ft., and 53¾ ft. at the base of the cap. The inside diameter at the base is 66½ ft.; at the top, 50 ft. In the base of the chimney are four flue openings. Fig. 6 is a view of the old and new chimneys, 185 ft. and 506 ft. high, respectively.

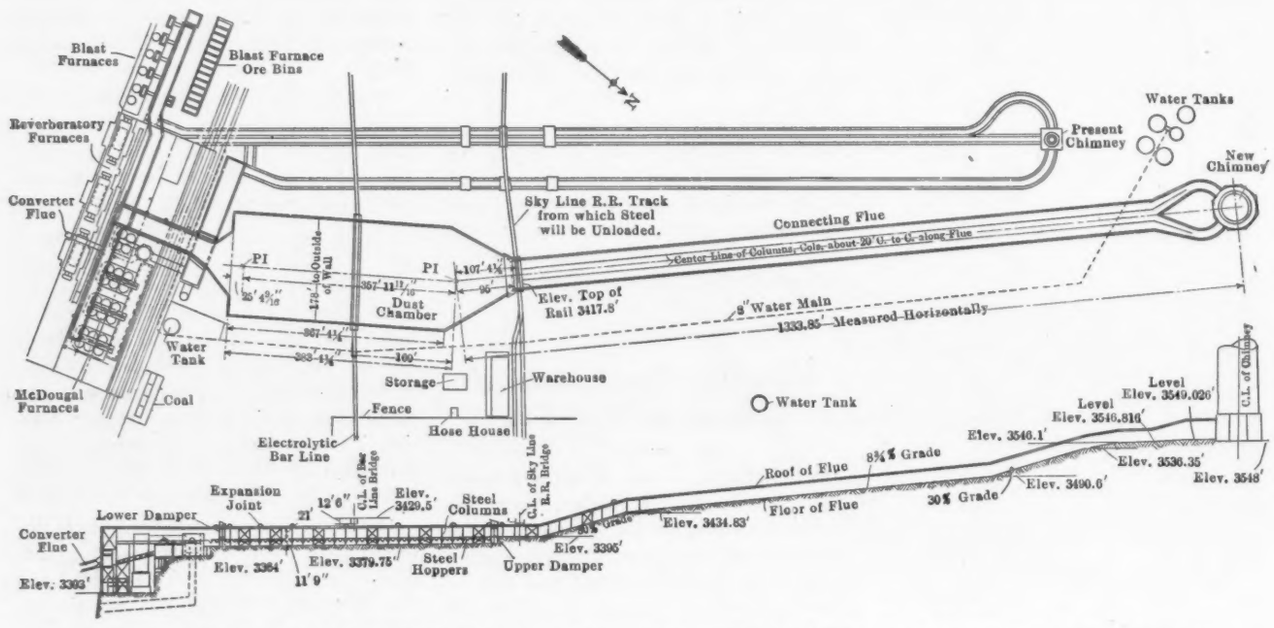


FIG. 1. GENERAL LOCATION PLAN OF SMELTER AND FLUE SYSTEM, AND SECTION THROUGH CONNECTING FLUE AND DUST CHAMBER

Chimney Lining

As a protection against the corrosive effects of the furnace gases, the chimney is lined with 4-in. radial perforated blocks, acid proof, installed in sections. Acid-proof mortar, made of silicate of soda, asbestos wool and other ingredients, was used. The chimney was first completed and the lining put in afterward. There is a 2-in. air space between the lining and the chimney proper, and every precaution is taken to prevent the gases

or metalliferous dust from entering the air space. In laying the cap for the protection of the top of the chimney from the action of acids which might form, special terra cotta blocks with interlocking sections for the joints were used. These blocks, or tiles, are laid in and pointed up with acid-proof cement mortar.

Protection Against Lightning; Ladderway

Protection against lightning is afforded by a lightning rod of 16 points, which projects 5 ft. above the top of the chimney. These rods are made of 1-inch round copper, coated with lead and tipped with 1¼-in. platinum points. Encircling the chimney a few feet below the top is a horizontal copper ring, from which two ⅝-in. stranded copper cables lead to the ground; this ring is connected to the lightning points. The copper ring and cables leading to the ground are coated with ⅛ in. lead 100 ft. from the top as a protection against acid. The copper cables leading to the ground terminate in 3-ft. ground plates, which are buried at a distance from the chimney.

On the outside of the chimney, built into the brickwork, is a ladderway consisting of one-piece rungs of ¾-in. round iron, 12 in. wide, and one-piece guard loop of the same material, 30 in. wide. The rungs stand 6 in. clear of the wall. The guard loops are 18 in. out from the rungs. Both guards and rungs are coated with lead for the upper 100 ft,; below this they are painted.

Flue and Dust Chamber

The connecting flue and dust chamber are shown in plan and section in Fig. 1; Figs. 7 and 8 give an idea of their construction. Between the smelter and the dust chamber the flue is of rectangular cross section, 33x21 ft. Between the dust chamber and the chimney the dimensions are 48x21 ft. The whole flue system is framed in steel, with steel columns and cross-beams; the walls and roof are made of the same material as the chimney. All steel work is exposed, both inside and outside. The dry gases have no corrosive action on the steel framework or the walls.

Fastened to the bottom of the I-beams of the roof of the dust chamber is a heavy copper wire net, from which is suspended long iron wires about 4 in. apart, forming a suspended network. The gases in passing through the chamber come in contact with the suspended wires and deposit thereon the suspended flue dust. All the wires below their upper support are connected with a shaker beam operated by a motor outside the walls of the dust chamber. By this means the dust clinging to the wires is shaken off and deposited in the hoppers provided in the floor of the dust chamber. Under this floor are 22 tracks over which are run trains of electrically operated dump cars; these cars receive the contents of the hoppers. The tracks are shown in Fig. 8.

The dust chamber is 176 ft. wide and 478 ft. long with a hight of 21 ft. in the clear. The basement story is 12 ft. high. The dust chamber is divided into two parts so that either side can be shut off and made accessible. For this purpose heavy cast-iron dampers are provided, operated by means of motors. There are no wires or hoppers in the connecting flue proper, between the dust chamber and the stack. The blast-furnace flue is provided with a hopper bottom, but no network of wires.

FIG. 2. FOUNDATION FOR CHIMNEY

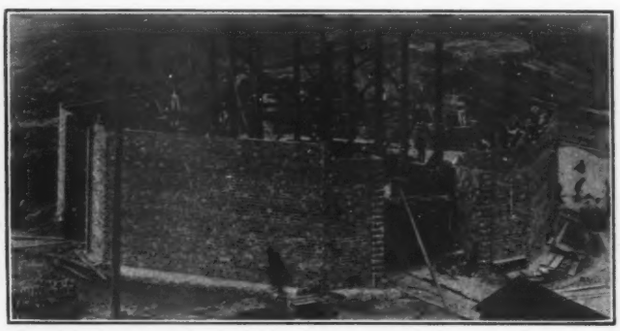


FIG. 3. FIRST 25 FEET OF CHIMNEY

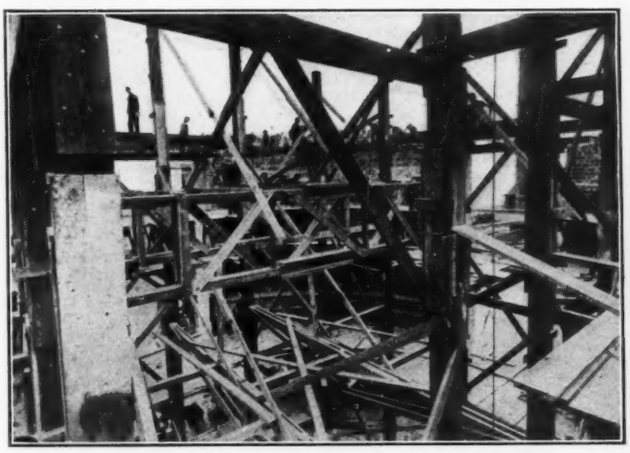


FIG. 4. DETAIL OF TOWER AND SCAFFOLD SHOWING TRUSS

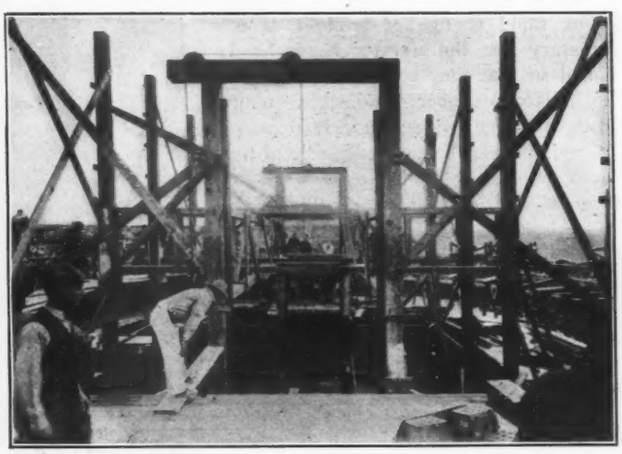


FIG. 5. DETAIL OF TOWER SHOWING ELEVATOR POSTS

The Scaffold and Tower

In the design and construction of this flue system and chimney the engineers and contractors were confronted by many problems. Probably the most important problem of the construction, as far as the contractor was concerned, was the efficient and safe handling of the 17,000 tons of blocks and mortar required in the work. The problem was to keep the men continually supplied with materials and at the same time provide safe conditions under which they might work at great hights. The inside diameter of the chimney was too great to permit of a single-stick system to support the working floor, or a system of floor beams which could be caried up, as is usual, as the chimney pro-

gressed. The scaffold had to be of such a design that after the working hours of the bricklayers, the floor system could be raised in the least possible time and a new scaffold prepared before the following morning. Provision for a sufficient number of elevators and their safe and speedy operation in handling 200 tons of material a day was also a factor in the scaffold problem.

A 12-post square tower of 10x10-in.x16-ft. fir timbers was finally decided upon. The construction and arrangement of this tower is shown in Figs. 3, 4 and 5. At each flue opening two of these 10x10 posts were placed to form a set of guides within which to operate a 6x9-ft. elevator. Strips of 2x4-in. oak, spiked to the 10x10-in. timbers, served as guides. The distance between elevator posts was about 7½ ft. The center span between two opposite posts was 30 ft. The catheads spanning the elevator posts were built of two 3x10-in. fir timbers, reinforced longitudinally with ¼x6-in. steel plates. The 3x10 timbers were spaced 2½ in. apart and between them operated the 14-in. sheaves in the iron boxes. These sheaves carried the elevator cable of ⅝ in. cast steel, operated in three cases by electric hoists at a speed of 300 ft. per min. The fourth elevator was run by a steam hoist of 35 h.p., at a speed of 600 ft. per minute.

For rapid change of scaffold, it was necessary that the elevator heads be designed so that they could be easily lifted off the 10x10 timbers, and when another post had been added, quickly replaced. For this reason the catheads of 3x10 timbers carrying the head sheaves were supported at their bearing ends with 10x9x¼-in. steel plates; one drilled to take a ¾-in. dowel pin from the top of the 10x10 posts, the other having a slotted ¾-in. hole to take up any slight variance in distance between the posts.

The ¾-in. dowel pins and plates held the elevator heads in place, with no further fastening, without accident, throughout the whole construction of the chimney. They were handled off and on by 18-ft. poles and a set of double blocks.

Throughout the tower the main posts were braced with 2x6-in.x16-ft. sway braces, bolted. Each section of post was doweled by a ¾x10-in. pin and spliced with 2x10-in.x5-ft. pieces, bolted. The sash bracing, which also formed the ledgers supporting the 8x8 timbers of the main scaffold, consisted of 3x10-in.x12-ft. timbers bolted to the posts. One end of the 8x8 floor beams of the main scaffold rested on the finished wall of the chimney; the other end was notched around the edge of the post and rested on the 3x10 against the post. The whole system bolted.

Spanning the 8x8 longitudinal main timbers were 6x6-in. floor beams, and on these were laid the 2x10-in. scaffold plank, forming a floor seven planks wide around the whole interior of the stack next to the wall, leaving the center open.

The maximum load on each post was calculated to be 18 tons. Being inside the stack, they were exposed to no wind pressure, except at the bottom at the flue opening for 36 ft., and that portion extending above the brickwork. It will be seen that the eight elevator posts which were carried to a hight of 516 ft. would have one side toward the elevator unsupported in that direction. To complete the rectangle and protect the unsupported side would have required an additional four posts with sway and sash bracing in the center of the stack. This would mean, at each raise of 17 ft. of the main scaffold, an operation necessitating speed, the raising of four 10x10 posts and the placing of all the extra bracing. To avoid this and prevent the crushing in of the posts, a system of four intersecting trusses was introduced every 30 ft. spanning the elevator posts. These were bolted together at their intersections and their upper and lower chords with connecting members, so designed as not to take a vertical load, but to resist a racking strain. These trusses were all framed and put together during the working hours of the bricklayers and were ready to hoist into place during the hours of raising the scaffold. Since they occurred at only every 30-ft. interval, it was at every other raise of the main scaffold that they became necessary. With a four-post system in the center, it would have been necessary to erect the posts and all their bracings at each raise of the scaffold; and the work would have to be done after the bricklayers' hours. The time consumed in raising the scaffold was between three and four hours, so naturally all the preparation for raising that could be made during the bricklayers' hours was that much saved.

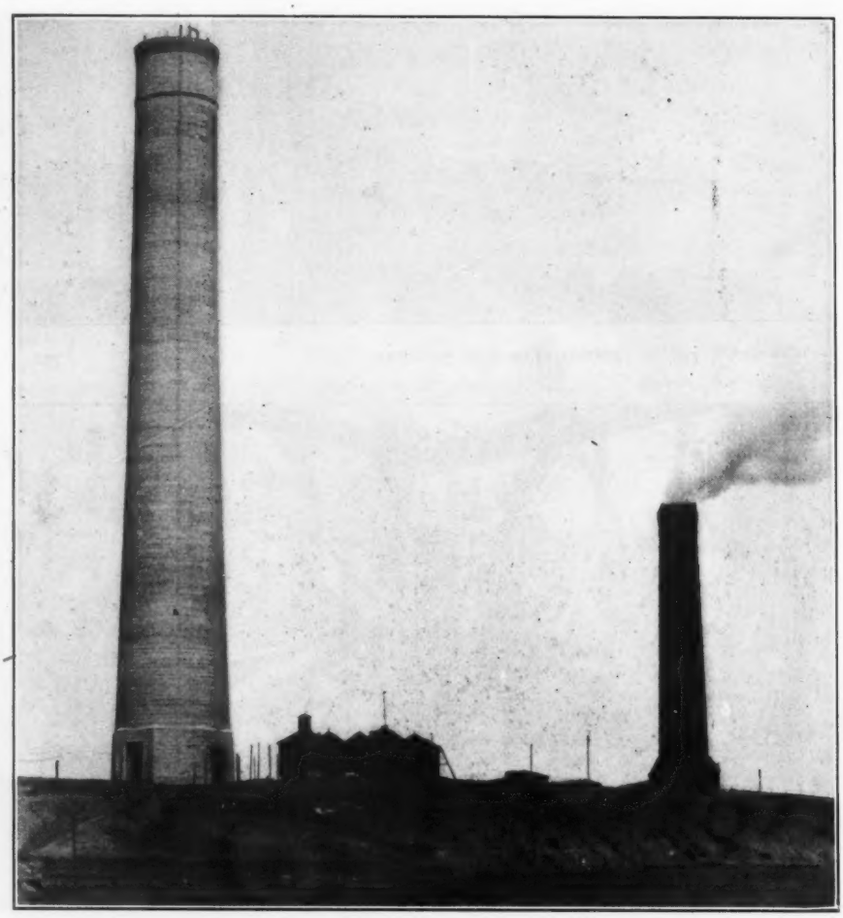


FIG. 6. THE NEW AND THE OLD CHIMNEY

On the main scaffold, when the wall had been built 6 ft., were placed a system of wooden horses, and a second floor built on them. From this point 6 ft. more wall was built, after which the men worked from benches 3½ ft. high and built 5 ft. more of wall, making 17 ft. from one main scaffold.

At the 17-ft. hight a second set of floor beams was put in, a new floor over these leaving the scaffold below intact so there were always three floors in place. The same wooden horses and benches were then used from this floor until the floor

below was stripped, after which it was used again above. In this manner a new scaffold was erected every 17 ft., the original floor being carried to the top, the heavy floor beams alone being left behind as braces for the main truss.

Plumbing the Stack

The method of plumbing the stack was unique. A 5-ft. plumb rule, set to the proper batter, was used on the outside of the stack. Each third course was plumbed around as the blocks were set in place.

FIG. 7. FRAMEWORK OF CONNECTING FLUE

On windy days, when a plumb bob was useless, the work was done from a set of levels fastened to a brass plate at the top of the plumb rule. By this means work could be carried on in a high wind. At times when the wind was blowing almost a gale, no delay was occasioned, although it took two men to hold the rule over the side of the stack.

In order to check the workmen, four transit points were set from ½ to ¾ of a mile away. These points were established before the stack was started, so that the transit line intersected the center of the stack. During the progress of the work this center from the foundation was thrown by means of instruments to the top of the stack and the center obtained on top by means of the intersection of two strings. The perimeter was then trammeled from this center. On calm days a check was taken to the center plug by means of a 30-lb. plumb bob. At no time was the center off over an inch, and at completion of the chimney no variation whatever could be determined.

As a means of communication between the men above and those below, a system of tin speaking tubes was maintained at each elevator well. This was fastened to one of the posts and the tubes extended with each raise of scaffold. The elevators were operated upon signals by electric bells, the push buttons being carried up with the scaffold.

The chimney was designed and erected by the Alphons Custodis Chimney Construction Company, of New York. The flue and dust chamber were designed by the Boston & Montana company.

Comparison of the Iodide, Cyanide and Electrolytic Methods for Copper

J. W. Howson (*Min. and Sci. Press*, Aug. 22, 1908) has compared the accuracy of the iodide, cyanide and electrolytic methods for the determination of copper.

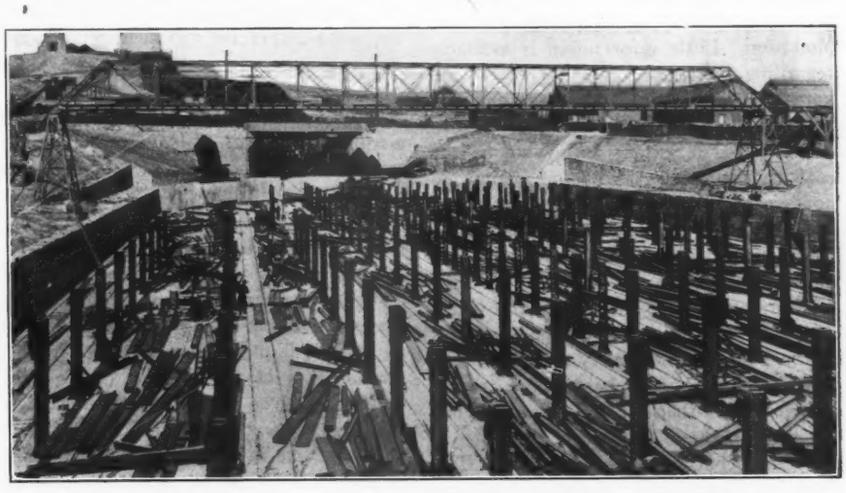


FIG. 8. LOWER FLOOR OF DUST CHAMBER

The customary procedure in cyanide and iodide assays is to precipitate the copper on aluminum foil from a sulphuric-acid solution. This separation is not complete, and may often explain the inaccurate results obtained. The presence of nitric acid, due to incomplete expulsion by sulphuric acid, or the presence of large amounts of iron salts is the cause of the incomplete separation, which source of error may be overcome by precipitating the last traces of copper with hydrogen sulphide and using hydrogen-sulphide water in the subsequent washing of the precipitate. Finely divided metallic copper or the sulphide is readily oxidized and solution then readily takes place. If this hydrogen-sulphide treatment is omitted the results by the iodide or cyanide methods are usually lower than by the electrolytic method provided that the electrolytic precipitation can be accurately made from a simple solution. There is also always a loss in filtering a copper solution, sometimes amounting to several hundredths of 1 per cent., which amount is retained by the filter paper even after many washings.

Appreciable amounts of iodine are liberated by impurities in the precipitated copper or in the reagents in using the iodide method and cause high results. This error, it is true, may offset the loss in filtration, but the counter-balancing is uncertain and is dependent upon the carefulness of the analyst.

Comparing the iodide and cyanide methods, the cyanide titration is rougher, much is left to the judgment of the operator, and the accuracy depends upon the closest adherence to the same working conditions as to bulk, foreign salts, and free ammonia as prevailed in the standardization.

The electrolytic method on simple ores gives accurate results, but unfortunately there are many ores which contain interfering elements. Except in the case of great excess of iron salts, the errors are nearly all positive and yield high results. The removal of the interfering elements requires a high degree of skill, and for these reasons the iodide method is preferable on impure ores. As between the three methods the electrolytic method is preferable where no previous separation of the copper from interfering elements is necessary, otherwise the iodide is better. The danger of error in the standardization of the iodide solution is more than offset by the loss of copper attending the removal of the cathode from the electrolyte. The cyanide method is the least satisfactory.

The Coalfields of the United States

Production of Coal, Including Waste, up to January 1, 1908, Was 10,218,000,000: Estimated Original Supply, 3,157,243,000,000 Tons

2000 BILLION TONS AVAILABLE

The accompanying map, redrawn from one prepared by the U. S. Geological Survey, shows the coalfields of the United States as their outline is now known and the kinds of coal they contain. Up to the present time it has not been possible to prepare so accurate a map, on account of lack of data regarding the shape and extent of many of the western coalfields and the quality of their coal, but during the last few years a large amount of such information has been obtained in connection with the classification and valuation of coal land in the public land States of the West. In carrying on this work the Geological Survey has mapped most of the important coalfields and has tested many of the coals, so that information now at hand seems to be fairly complete. There is still, however, considerable uncertainty regarding the extent and value of some fields containing low-grade coal or lignite. This is particularly true of the lignite fields of the Gulf province, except those of Texas, in which there has been considerable development and exploitation. Little information is available regarding the lignite areas of south Dakota and the lignite and sub-bituminous fields of the Fort Union region, in eastern Montana. The extent and value of the coal beds of the Assiniboine region, in north central Montana, as well as those of the isolated Tertiary lake basins of the mountainous parts of the State, are also matters of speculation.

Information as to the extent, the value, and even the existence of the coalfields of the Pacific coast is very meager. California and Oregon probably have greater coal resources than those now known, but the beds in these States are generally of low-grade coal and are undeveloped. The fields of Washington doubtless embrace a much greater area than that shown on the map, but they are so covered by glacial gravel and heavy timber that it is impossible to determine their extent. Probably many of the areas represented on the map are really connected in a broad belt of coal-bearing rocks along the west slope of the Cascade range.

Little is known regarding the occurrence of coal or the extent of the fields in southern and southeastern Utah, where there are probably many areas of coal-bearing rocks but little coal of commercial importance.

On this map, for the first time, an attempt has been made to represent the coal in the deep basins or synclines of the Rocky Mountain States, where there is every reason to suppose that coal exists, although it is so deeply covered by later sediments as to be accessible with great difficulty if at all. The most important of these basins are the San Juan River basin of New Mexico and the Colorado, the Uinta basin of Colorado and Utah, the Green River basin of Wyoming and Colorado, and the Bighorn basin of Wyoming. None of the basins and troughs of the eastern part of the country is like these western basins, except, possibly, the central part of the Appalachian trough in West Virginia and a part of the Michigan basin, but both of these are comparatively shallow, and all of the coal they contain may be regarded as accessible.

Character of the Coals

From a commercial standpoint the most important feature of the map is the distinction between the various grades of coal. The Geological Survey recognizes the following six classes: (1) anthracite, (2) semi-anthracite, (3) semi-bituminous, (4) bituminous, (5) sub-bituminous (black lignite), and (6) lignite.

In almost all the western fields there is a transition from low-grade to high-grade coal in the direction of the principal mountain uplift. In the San Juan River region the coal changes from sub-bituminous in the southern part to bituminous on the flanks of the San Juan mountains, the transition in the field being gradual and not sharp. In the Uinta basin the coal is bituminous, and of fairly uniform quality in all parts of the rim. In the Green River basin most of the coal is sub-bituminous, but some around the Rock Springs dome in Wyoming is bituminous, as is the lower coal in the eastern part of the Yampa field in Colorado. In the Bighorn basin the coal does not differ much in composition from place to place; in general it is better on the southwestern side of the basin, but even there it hardly reaches the grade of bituminous. In the Fort Union region there is a decided change from the brown lignite of the North Dakota portion to the sub-bituminous coals of the Sheridan district in Wyoming. This change is gradual, affecting a wide region in eastern Montana.

Geologic Age of the Coals

The geologic age of the coal-bearing rocks of the United States ranges from Carboniferous in the eastern and interior provinces to Miocene (Tertiary) in California and other places on the Pacific coast. In a very general way the quality of the coal varies with the geologic age of the coal beds, but there are so many exceptions that such a generalization has little value.

In the main the best coals of the country are of Carboniferous age and are found in the anthracite and Appalachian fields; also in the northern, eastern, western, and southwestern regions of the eastern and interior provinces. In this broad area the coals of higher grade occur in the anthracite region, along the eastern front of the Appalachian region, and in the Arkansas fields of the western region near centers of great disturbance and mountain building.

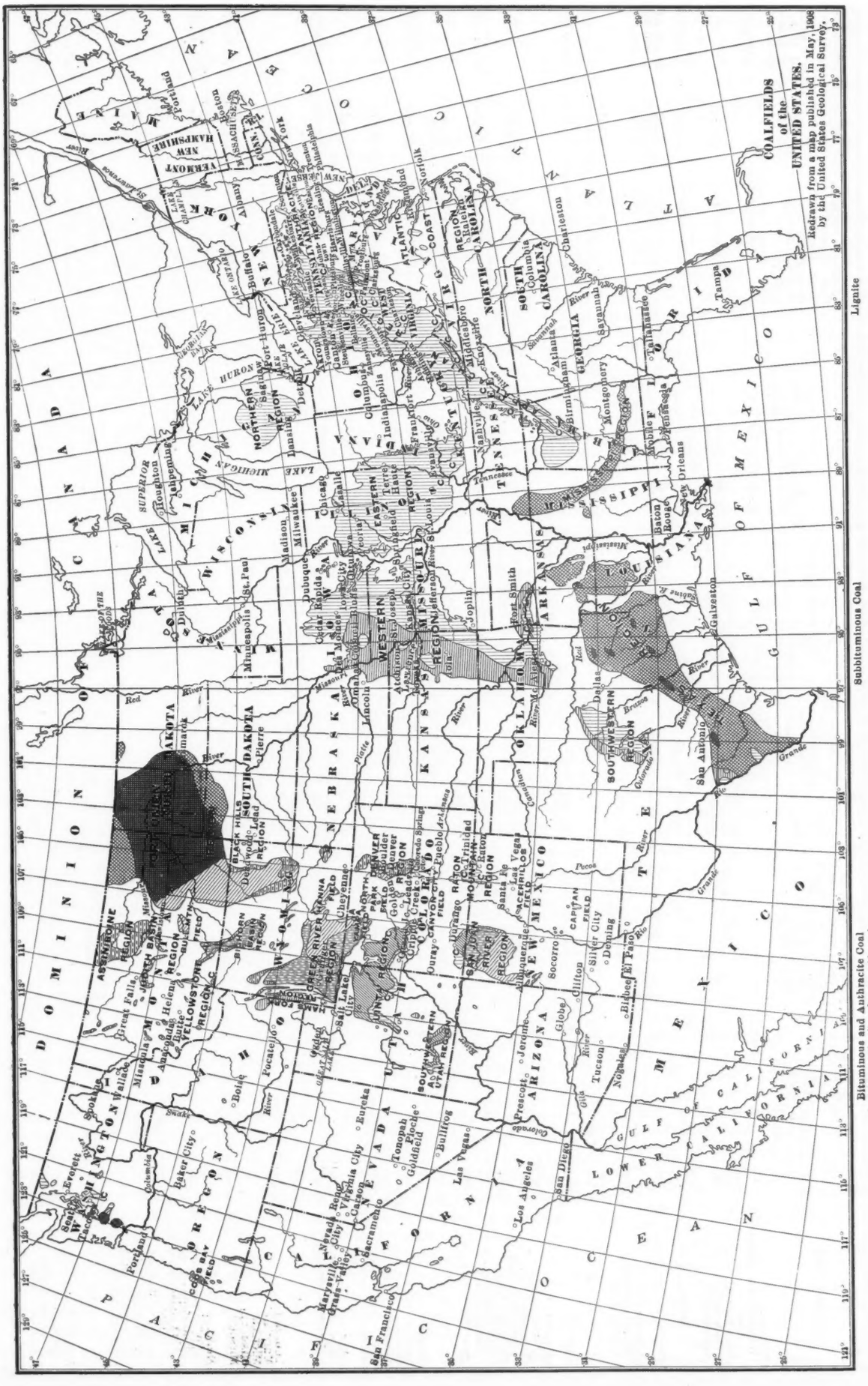
In the Atlantic Coast region a number of basins of Triassic rocks contain workable beds of coal. In the early days of the colonies these were of great importance, but later they fell into disuse and are now practically abandoned.

The lignites of the Gulf province are of Eocene (Tertiary) age and are of low grade except in the vicinity of Laredo, on the Mexican line. Those of the Eagle Pass region are of better grade and are decidedly older, belonging to the Cretaceous system.

In the Rocky Mountain and Northern Great Plains provinces the coal-bearing rocks range in age from Lower Cretaceous to Eocene (Tertiary). The former occur in the Great Falls and Lewistown fields of the Judith basin, central Montana, and in the Black Hills region, Wyoming. These rocks are of Kootenai age, the age of the rocks of the Crows Nest Pass and other important fields of Alberta.

Upper Cretaceous rocks carry most of the coals in the San Juan River and Raton Mountain regions of southern Colorado and New Mexico, as well as those in most of the scattered fields of New Mexico. In the other fields of Colorado and Utah almost all the coal beds so far known are of this age. In Wyoming, Upper Cretaceous coals are present in the Hams Fork, Green River and Bighorn Basin regions, and in the Hanna and other smaller fields. In Montana they are limited largely to the Yellowstone and Assinniboine regions and to the Bridger field, in Carbon county.

The great expanse of coal of the Fort Union region of North Dakota, South


COALFIELDS of the UNITED STATES.
Redrawn from a map published in May, 1906 by the United States Geological Survey.
Lignite
Subbituminous Coal
Bituminous and Anthracite Coal
A, indicates anthracite coal; C, coking coal.
Areas containing workable coal beds.
Areas that may contain workable coal beds.
Areas containing workable coal beds under such heavy cover as not to be available at present.
Areas probably containing workable coal beds under such heavy cover as not to be available at present.
Areas containing workable coal bed.
Areas that may contain workable coal beds.
Areas probably containing workable coal beds under such heavy cover as not to be available at present.
Areas containing workable lignite beds.
Areas that may contain workable lignite beds.
Areas probably containing workable lignite beds under such heavy cover as not to be available at present.
DOMINION OF CANADA
NEWFOUNDLAND
ATLANTIC OCEAN
GULF OF MEXICO
PACIFIC OCEAN
GULF OF CALIFORNIA
LOWER CALIFORNIA
MEXICO
NORTHERN REGION
EASTERN REGION
WESTERN REGION
SOUTHWESTERN REGION
ATLANTIC COAST REGION
SOUTH BASIN REGION
YELLOWSTONE REGION
BIG HORN BASIN REGION
BLACK HILLS REGION
POWDER RIVER REGION
FORT UNION REGION
GREEN RIVER REGION
UINTA REGION
SOUTHWESTERN UTAH REGION
SAN JUAN RIVER REGION
RATON MESA REGION
TRINIDAD REGION
CANON CITY REGION
SOUTH PARK REGION
DENVER REGION
CRIPPLE CREEK REGION
SOUTHWESTERN REGION
CENTRAL REGION
ASSINIBOINE REGION
CRETACEOUS REGION
TERTIARY REGION
CARBONIFEROUS REGION
CARBONIFEROUS AND CRETACEOUS REGION
CRETACEOUS AND TERTIARY REGION
TERTIARY AND QUATERNARY REGION
CRETACEOUS AND TERTIARY REGION
CARBONIFEROUS REGION
CRETACEOUS REGION

Areas, Estimated Tonnage, and Production of the Various Coal-fields of the United States.

[A = Anthracite. B = Bituminous. S = Subbituminous. L = Lignite.]

State and Field.	Area in Square Miles.			Kind of Coal.	Estimated Original Coal Supply in Short Tons. Coal Both Easily Accessible and Accessible with Difficulty.	Production in Short Tons.	
	Containing Workable Coals.	May Contain Workable Coals.	Coal Under Heavy Cover.			1906.	Total to January 1, 1908, Including Waste.
Alabama:							
Warrior and Plateau fields	7,845	.....	.....	B	63,513,000,000	11,301,993	.....
Cahaba field	325	.....	.....	B	2,994,000,000	1,635,907	.....
Coosa field	260	.....	.....	B	2,396,000,000	170,063	.....
Lignite field	.....	6,000	.....	L	.....	.....	.....
Total	8,430	6,000	.....	.....	68,903,000,000	13,107,963	247,000,000
Arizona	30	.....	.....	B	60,000,000	.....	.....
Arkansas:							
Bituminous field	1,584	.....	.....	B	1,797,000,000	1,934,673	.....
Lignite field	100	5,900	.....	L	90,000,000	.....	.....
Total	1,684	5,900	.....	.....	1,887,000,000	.....	36,000,000
California	500?	.....	.....	S, B	1,000,000,000	25,290	7,000,00
Colorado:							
Denver region	600	3,700	.....	S	13,590,000,000	1,544,776	.....
Durango field	1,380	.....	520	B, S	21,428,000,000	177,718	.....
North Park field	20	480	.....	S	453,000,000	1,300	.....
Trinidad field	1,080	.....	.....	B	24,462,000,000	6,572,673	.....
Uinta region	6,000	.....	.....	B, A	271,810,000,000	1,143,310	.....
Yampa field	700	.....	2,300	B, S, A	39,639,000,000	5,407	.....
Scattered fields	350	.....	.....	B, S	388,000,000	666,034	.....
Total	10,130	4,80	2,820	.....	371,770,000,000	10,111,218	169,000,000
Georgia	167	.....	.....	B	933,000,000	353,548	12,000,000
Idaho	200	1,200	.....	S, B	600,000,000	5,882	.....
Illinois	35,600	.....	.....	B	240,000,000,000	38,434,363	968,000,000
Indiana	6,500	.....	.....	B	44,169,000,000	11,895,252	239,000,000
Iowa	12,560	5,640	.....	B	29,160,000,000	6,798,609	212,000,000
Kansas	3,100	15,780	.....	B	7,022,000,000	6,423,979	136,000,000
Kentucky:							
Eastern Kentucky	10,270	.....	.....	B	67,787,000,000	3,768,651	.....
Western Kentucky	6,400	.....	.....	B	36,241,000,000	5,884,996	.....
Total	16,670	.....	.....	.....	104,028,000,000	9,653,647	184,000,000
Louisiana	8,800	.....	.....	L	.....	.....	.....
Maryland	455	.....	.....	B	8,044,000,000	5,108,539	221,000,000
Michigan	11,000	.....	.....	B	12,000,000,000	1,473,211	21,000,000
Mississippi	7,500	.....	.....	L	.....	.....	.....
Missouri	16,700	6,300	.....	B	40,000,000,000	3,983,378	146,000,000
Montana:							
Fort Union region	32,300	6,100	.....	L, S	279,500,000,000	.....	.....
Bull Mountain field	754	.....	.....	S	6,560,000,000	.....	.....
Red Lodge and Bridger fields	47	100	.....	S	2,000,000,000	557,148	.....
Judith Basin region	516	2,500	.....	B	2,000,000,000	1,058,763	.....
Assiniboine region	.....	8,000	.....	S	10,000,000,000	13,550	.....
Yellowstone region	450	.....	.....	B	3,000,000,000	200,460	.....
Scattered fields	.....	875	.....	S, L	.....	.....	.....
Total	34,067	17,575	.....	.....	303,060,000,000	1,829,921	37,000,000
New Mexico:							
Raton field	1,360	.....	.....	B	30,805,000,000	1,292,241	.....
San Juan region	11,600	.....	5,000	S	131,375,000,000	604,517	.....
Scattered fields	375	.....	.....	B, A, S	1,600,000,000	67,955	.....
Total	13,335	.....	5,000	.....	163,780,000,000	1,964,713	33,000,000
North Carolina	60	.....	.....	B	200,000,000	.....	1,000,000
North Dakota:							
Western fields	31,240	3,900	.....	L	500,000,000,000	317,542	.....
Turtle Mountain field	.....	360	.....	L	.....	.....	.....
Total	31,240	4,260	.....	.....	500,000,000,000	317,542	4,000,000
Ohio	12,660	.....	.....	B	86,028,000,000	25,552,950	739,000,000
Oklahoma	10,000	.....	.....	B	79,278,000,000	2,924,427	60,000,000
Oregon	230	.....	.....	S	1,000,000,000	109,641	2,000,000
Pennsylvania:							
Anthracite region	480	.....	.....	A	21,000,000,000	71,282,411	.....
Bituminous fields	14,200	.....	.....	B	112,574,000,000	129,293,206	.....
Total	14,680	.....	.....	.....	133,574,000,000	200,575,617	5,652,000,000
South Dakota	2,000	4,000	.....	L	10,000,000,000	.....	.....
Tennessee:							
Bituminous fields	4,400	.....	.....	B	25,665,000,000	5,766,690	.....
Lignite fields	1,000	.....	.....	L	.....	.....	.....
Total	5,400	.....	.....	.....	25,665,000,000	5,766,690	126,000,000
Texas:							
Bituminous fields	8,200	5,300	.....	B	8,000,000,000	839,985	.....
Lignite fields	2,000	53,000	.....	L	23,000,000,000	472,888	.....
Total	10,200	58,300	.....	.....	31,000,000,000	1,312,873	22,000,000
Utah:							
Uinta region	9,990	.....	.....	B	150,970,000,000	1,701,674	.....
Southwestern Utah region	3,140	1,500	.....	B, A	45,438,000,000	.....	.....
Scattered fields	.....	500	.....	B, S	50,000,000	70,877	.....
Total	13,130	2,000	.....	.....	196,458,000,000	1,772,551	28,000,000
Virginia:							
Southwestern fields	1,550	.....	.....	B	21,000,000,000	4,205,019	.....
Brushy Mountain fields	200	.....	.....	.....	900,000,000	49,860	.....
Richmond fields	150	.....	.....	b	600,000,000	.....	.....
Total	1,900	.....	.....	.....	22,500,000,000	4,254,879	86,000,000
Washington	1,100	.....	.....	B, S	20,000,000,000	2,864,926	64,000,000
West Virginia	17,000	.....	.....	B	231,039,000,000	87,791,580	650,000,000
Wyoming:							
Fort Union region	11,530	3,060	.....	S	174,600,000,000	1,091,499	.....
Bighorn Basin region	905	430	2,830	S	1,000,000,000	5,451	.....
Hanna field	1,435	240	290	S	33,000,000,000	450,636	.....
Green River region	4,855	1,350	20,750	B, S	199,152,000,000	2,122,253	.....
Hams Fork region	1,073	960	115	B, S	16,000,000,000	2,078,772	.....
Black Hills region	320	.....	.....	B	133,000,000	385,383	.....
Scattered fields	450	200	.....	S	200,000,000	.....	.....
Total	20,568	6,240	23,985	.....	424,085,000,000	6,133,994	116,000,000
Total for United States	327,596	137,375	31,805	.....	3,157,243,000,000	414,157,278	10,218,000,000

Dakota, Montana, and Wyoming is of Eocene (Tertiary) age. Coals of the same age occur in the Bull Mountain field, on Musselshell river, and in the Red Lodge field, on the southern boundary of Montana. Eocene coals also occur in the Green River basin east of Rock Springs, in the center of the Hanna field, and in certain parts of the Hams Fork region, in Wyoming.

The mountain basins in the western part of Montana, as well as some in Idaho, are of Tertiary age, although few of them have been mapped and the coals of only a few have been examined.

In the Pacific Coast province all the coals are of Tertiary age, though some of them have been locally metamorphosed into anthracite by intrusions of igneous rock. The Washington coals, as well as those of the Coos Bay field in Oregon, are Eocene; those of west-central California —at least those in Stone cañon, Monterey county—are Lower Miocene.

Estimated Tonnage of the Various Fields

During the last few years considerable attention has been given to the need of conserving the mineral fuels of this country for the use of future generations. Few persons were in possession of data that would enable them to make an estimate of the amount of coal yet remaining in the ground, and no one knew whether or not the present growing consumption would continue indefinitely; consequently there has been a general feeling that the supply of coal in the United States is inexhaustible, and that the present generation need give no thought to this troublesome question.

The uncertainty regarding future consumption still exists, but data are now at hand, except for certain little-known fields of the West, that will afford the basis for a fairly trustworthy estimate of the tonnage of coal yet remaining. These western fields, however, except those of Washington, are of small extent, and the uncertainty as to their content has little effect on the aggregate amount.

The latest available estimate of the total original tonnage of the coalfields of the United States, exclusive of Alaska, was made by the Geological Survey in 1906. This estimate gave 2200 billion short tons as the total original content of the fields, but was confessedly made without adequate information, since little was known at that time regarding many of the most important fields of the Western States. With the increased information at hand regarding these fields, it seems opportune now to present an estimate considerably larger than that made two years ago. Part of this difference is due to increase in information, and part to an increase in the limit of depth to which coal beds may be worked.

The limit of workable depth in the estimate here given is based on actual mining conditions abroad, especially in Belgium. This limit is 3000 ft. for coal and 1000 ft. for lignite. Twenty inches is regarded as the minimum minable thickness of bed for coal and 3 ft. for lignite.

The table shows the size of areas represented on the map, in square miles; the kind of coal; the production in 1906; the total production to date, including estimate of production for 1907, to which is added 50 per cent. for waste in mining; the estimated original tonnage; and the estimated amount remaining in the ground at the present time.

The figures given show that the area of the more accessible coalfields of the United States is about 327,000 square miles, and that they carry an estimated content available for future use of nearly 2000 billion tons. The rate of consumption cannot be predicted with certainty, but if the rate of increase that has held for the last 50 years is maintained, the supply of easily available coal will be exhausted before the middle of the next century.

TONNAGE (SHORT TONS) BY PROVINCES AND ACCESSIBILITY.

Province.	Area in Square Miles.	Original Coal Supply.		Easily Accessible Coal Still Available.
		Amount Easily Accessible.	Amount Accessible With Difficulty.	
Eastern	70,022	636,673,000,000	8,000,000,000	628,870,000,000
Interior	144,664	406,667,000,000	91,000,000,000	404,726,000,000
Gulf	84,300	13,045,000,000	10,045,000,000	13,031,000,000
Northern Great Plains	103,564	521,793,000,000	459,000,000,000	521,764,000,000
Rocky Mountains	92,396	414,740,000,000	574,280,000,000	414,382,000,000
Pacific Coast	1,830	11,100,000,000	10,900,000,000	11,027,000,000
Total	496,776	2,004,018,000,000	1,153,225,000,000	1,993,800,000,000

TONNAGE (SHORT TONS) BY GRADES OF COAL AND ACCESSIBILITY.

Kind of Coal.	Area in Square Miles.	Original Coal Supply.		Easily Accessible Coal Still Available.
		Amount Easily Accessible.	Amount Accessible With Difficulty.	
Anthracite and bituminous	250,531	1,257,766,000,000	505,730,000,000	1,247,672,000,000
Sub-bituminous	97,636	356,707,000,000	293,450,000,000	356,594,000,000
Lignite	148,609	389,545,000,000	354,045,000,000	389,534,000,000
Total	496,776	2,004,018,000,000	1,153,225,000,000	1,993,800,000,000

Coalfields of the Big Horn Basin

A party of coal geologists of the United States Geological Survey have been at work during the summer in the examination of the coal deposits of the southeastern part of the Bighorn Basin. The party consisted of E. G. Woodruff and Max A. Pishel, of Washington, D. C., Roy L. Nelson and J. H. Cather, of Lincoln, Nebraska and Jesse Gallaway, of Bloomington, Indiana. The region examined by these men lies between Nowater creek and Bighorn river. Preliminary surveys had shown that outside of this area no workable coal beds are to be found between the mountains and Bighorn river, south of a line running east from the mouth of Nowater creek. In the area where coal was known to occur, the geologists made careful examination of the coal deposits, measuring the thickness of the coal beds, determining their extent and gathering such other information as might aid anyone who wished to develop mines.

"The most promising beds of coal," said Mr. Woodruff, who was in charge of the work, "occur along Nowater creek and north of Kirby creek, near Bighorn river. These later deposits are the eastward extension of the beds mined at Gebo and Crosby. Less important deposits occur at several places along Nowater creek, also near the head of Bud Kimball Draw, and on the upper branches of Big Cottonwood creek.

Water and Gas Occur only in Small Quantities

Those coal beds generally are not so thick or extended as those found elsewhere in the Bighorn Basin. In fact, they seem to be too limited to warrant the construction of a railroad for their development alone. There is sufficient coal, however, to furnish an abundant and permanent supply to the ranchers living within reach of the various beds. The examination shows too that the beds dip at favorable angles for mining and that water and gas occur in such small quantities that no difficulty will be experienced from these elements which are often troublesome in coal mines.

The geologists class this coal as subbituminous. This means that the coal is better than the brown lignites mined at many places in the West, but not so good as the bituminous coal of Pennsylvania or West Virginia. The coal in the southeastern part of the Bighorn Basin is about the same grade as that mined at Gebo and

Crosby. It contains a small per cent. of ash, a low per cent. of sulphur and is non-coking. The coal ignites readily and burns freely. Such coal is best suited for domestic purposes, but, with proper grates and drafts, can be successfully used for steaming.

Samples of the coal were sent to the laboratories of the Geological Survey for analysis, so that the quality of this coal may be known exactly and compared with coal from other fields.

The work done this year completes the Survey's investigations of the coal deposits of the Bighorn Basin. Last year one party surveyed the west side of the Basin and another the area lying to the northeast. Reports on the areas mapped last year are now being printed at the Government printing office in Washington, and will soon be ready for free distribution. Anyone desiring these reports can obtain them by addressing the Director, U. S. Geological Survey, Washington, D. C. The report on the area surveyed this year will be written by the geologists in Washington this winter, and when published will be sent to anyone wishing to know about this coalfield.

The Tariff Hearings at Washington

SPECIAL CORRESPONDENCE

Considerable numbers of briefs continue to be filed with the House Ways and Means Committee including many that deal with the duties on metals and minerals and their products.

COAL AND IRON

In one of these briefs C. M. Freeman, for the National Grange, asks that forest, coal and iron products be placed on the free list. The Harrison Supply Company, Boston, Mass., asks abolition of the duty on iron sand.

I. W. Kuhn, Pittsburg, Penn., writes in advocacy of a policy of reciprocal free coal with Canada. The Fairmont Coal Company, of West Virginia, opposes free coal unless coupled with a reciprocity provision. The National Forest Conservation League has filed further argument and a mass of correspondence favoring removal of the duties on lumber in the interest of better conservation of resources. H. L. Stowell, Ellensburg, Wash., has filed argument in favor of the free admission of Canadian coal and lumber. Hon. Jas. Kennedy transmits a number of protests against the granting of drawbacks on tinplate. Ralph H. Stearns, New York, asks reduction or removal of the duties on steel.

LEAD AND ZINC ORES

A. B. Cockerill, Nevada, Mo., files a supplemental argument against the proposed duty on zinc ore. Edward Brush, of the American Smelting and Refining Company, files estimate of 81c. to $1.48 per ton as the cost of laying down a ton of 5 to 14 per cent. lead ore at the mouth of one of the four largest mines in Mexico controlled by his company. He also corrects some points in his previous testimony before the committee.

RARE METALS AND ALLOYS

Charles Engelhard, New York City, asks that rhodium and ruthenium be placed on the free list along with platinum, iridium, palladium and osmium. W. B. Klee, Damascus Bronze Company, Pittsburg, Penn., submits correspondence showing that the Treasury refuses to make phosphor-copper and tin dutiable unless phosphorus is the element of chief value. R. F. Long, New York City, importer of phosphor-manganese and silicon-copper argues against any duty on phosphor-copper and tin.

MINERAL PAINTS

Peter Zucker, New York, "in behalf of the manufacturers of dry colors of the United States" submits a dry-color schedule providing that Berlin, Prussian, Chinese and other blues containing ferrocyanide of iron remain at 8c. per lb.; that all chromium colors in which lead and bichromate of potash are used remain at 4.5 per lb.; that in either of the foregoing cases if there be a reduction a corresponding reduction in the constituents (potash, lead, etc.) be made; that colors containing quicksilver be raised from 10 to 15c. per lb.; that white sulphate of zinc now dutiable at 1.25c. per pound be particularly maintained at its present rate; that in case of any reductions in the tariffs on colors there be corresponding reductions on a large number of articles including barytes, white lead, whiting, oxide of zinc, quicksilver, etc. F. A. Reichard, New York, asks that ochers, umbers and siennas and dry zinc be free of duty; that orange mineral be reduced to 1.55c. from 3.375c.; red lead to 0.99c. from 2.875c. and white lead to 0.93c. from 2.875c.; that ultramarine blue be reduced by an indeterminate amount; natural oxides of iron 40c. per ton; artificial oxides to 15 instead of 30 per cent. English vermilion be taxed at rates varying from 5c. (the present duty) to free entry. These views are supported by a large collection of letters from paint-makers stating the rates they prefer and generally concurring with the above recommendations. J. Lee Smith & Co., New York City, urges maintenance of the present classification of ocher, sienna and umber.

PHOSPHATES AND FERTILIZERS

J. L. Hills, director Vermont Agricultural Experiment Station, asks that all fertilizers be admitted free. E. H. Jenkins, director Connecticut Agricultural Experiment Station, asks free entry for sulphate of ammonia. Wm. P. Brooks, director Massachusetts Agricultural Experiment Station, asks that guano, sulphate of ammonia, basic slag-meal and land plaster be admitted free. Similar views are taken by the directors of a number of other New England agricultural experiment stations.

MISCELLANEOUS

Watson Brothers, Boston, Mass., importers of mica, favor removal of the present ad valorem rate of 20 per cent. and retention of the existing specific duty.

Hon. W. P. Brownlow files a letter from H. E. Graves, Bristol, Tenn., asking a duty of $5 per ton of 2000 lb. on crude barytes, $12 per ton on manufactured barytes and $25 per ton on barium salts, precipitated barytes and their compounds.

The Wadsworth Stone and Paving Company, Pittsburg, asks that the duty on asphalt be raised. Jno. W. Langley presents a letter from the Albany Mining & Investment Company, Monon, Ky., and asks a reasonable tariff on fluorspar. Thos. H. B. Haase, Princeton, Ky., asks a duty of $1 per ton. The Sunny Brook Lead and Fluorspar Company, asks a tariff of $3 per ton. The O'Rourke-McCabe Plastering Company, New York City, asks free entry for Nova Scotia gypsum. The Angels Marble Company, Vallicita, Cal., asks a reduction of the tariff on marble. The Chavant Manufacturing Company, Jersey City, asks that plastilena be placed in the tariff act as a classified manufactured article dutiable at 50 per cent. The American Emery Wheel Works, Providence, R. I., asks to have pulverized corundum placed on the free list.

New Method of Preparing Sand for Leaching

A new method for removing slime and water from gold-bearing sand, devised by W. A. Caldecott, has been in use at the Knights Deep and the Simmer & Jack Proprietary mines for some time, and is being adopted by the East Rand Proprietary Mines (*South African Mining Journal*, Sept. 12, 1908). The sand and slime are run to conical classifiers; the sand and water coming off at the bottom runs to a slowly rotating horizontal vacuum filter table. The moist sand is scraped off from the table by a fixed plow into a hopper where it is mixed with a constant flow of cyanide solution. The mixture of sand and solution is then transferred to a large vat where it is leached in the ordinary way. This vat before receiving sand is filled with solution, and the overflowing solution is returned to the hopper. By means of this process, costs have been reduced and the extraction increased as the sand is more leachable.

The London Copper Market in 1908

SPECIAL CORRESPONDENCE

January disclosed an increase of 1922 tons in the visible supply, bringing the total up to 19,710 tons. There was, however, considerable activity in trade, chiefly with India; and confidence was further inspired by the improved outlook in American finance, as also by the early reduction of the official English bank rate from 7 to 6 per cent. Standard copper, which had closed in December at £60 15s. for cash warrants, opened with an advance of 5s., advancing to £62 10s., with three months' warrants touching £63 10s.; and the price of Lake Superior brands advanced to 13¾@13⅞. This advance was partly lost by the early intervention of bears, whose operations were prompted by the aforesaid statistics; and the market remained uneventful for the first week or so. On Jan. 9 renewed activity was inspired by increased firmness on the part of American producers, coupled with improved American demand. Consumers and speculators bought freely, thereby carrying the price of three months' warrants up to £64 15s., which price was registered on Jan. 15; Indian and Chinese orders contributing to the improvement. Sales were largely covered with American supplies, whereby the American producers were relieved of substantial quantities and were accordingly firm in holding for full prices. The London market suffered some temporary relapse caused by bear sales, but quickly recovered in virtue of good trade. On Jan. 21 Wall Street began to display new signals of distress which induced a decline, which even reductions in the European bank rates could not arrest. The inertia thus produced became gradually more pronounced on the rumor of certain mines being reopened, notwithstanding the already ample scale of production. The closing days of the month witnessed restricted business and a gradual decline down to £61 2s. 6d. for cash warrants, and £61 15s. for three months; the American quotation being meanwhile reduced 12½ points.

February found the market devoid of any feature of interest to stimulate operations in either direction. The tendency soon became weak in response to unpromising advices from the United States, and values declined accordingly to £60 7s. 6d. cash, and £61 forward. These figures prompted bear covering, which quickly raised the latter value to £62 15s., which price was paid on Feb. 5. Heavy sales followed, coinciding with disappointing reports from the consuming centers and complications in the American industrial situation. An almost uninterrupted decline carried values down until on Feb. 19 three months' warrants touched £56 12s. 6d.; American prices being meanwhile reduced in proportion. Much of the selling on the London market was understood to be for American account, and was further prompted by grave apprehensions of trouble in the British shipbuilding and engineering industries. On Feb. 20 better news from Wall Street, and a brighter outlook in the labor question, caused a rally which carried three months' warrants to £59 10s. During the decline, however, bears had covered their commitments and the bull account now predominated. Important business with consumers in France and Germany infused some genuine vitality into the market, as also did persistent orders from China—chiefly for electrolytic. American business, however, remained very slack, and the New York price had drifted down to 12c. before any improvement set in. The remainder of the month saw fluctuations within narrow limits, and copper shares were strengthened by rumor of impending resumption of work at the Anaconda and other mines in Montana. The official price of sheet copper was advanced £2 per ton. The closing prices of Standard were £58 for cash warrants, and £58 12s. 6d. for three months.

In March, recent firmness was early dispelled by official announcement that the mines and smelters of the Amalgamated company would resume work to their full capacity. The news was not unexpected, but its effect was nevertheless depressing, and was followed by successive cuts in New York down to 12.37½@12.50c., or within a fraction of the lowest recorded in recent years. On the other hand some confidence was imparted by improved tone in the stock and share markets; and fluctuations were, therefore, within narrow limits, notwithstanding the restricted operations of consumers and the eager competition for their orders. On March 12 some revival was manifest, due to revived demand, especially for electrical work, and the low ebb to which consumers had allowed their stocks to diminish. A similar movement took place in America where the revival, though rather feeble, was none the less welcome. A good inquiry from Indian markets and a more cheerful tone on the Stock Exchange also imparted strength. The price of three months' warrants accordingly advanced from £58 2s. 6d. on March 11 to £60 which was paid on March 16. A temporary reaction then set in, mainly induced by bear selling; but sentiment was very diverse, and confidence was somewhat inspired by reduction of the official bank rate of interest to 3 per cent. By this time American producers had been largely relieved of surplus stock and were accordingly firmer in their quotations, and various industrial enterprises which had been retarded during financial unrest were again under consideration. The fourth week of the month witnessed a large speculative business in copper and tin, the former being apparently connected with operations in copper mining shares; but the consumptive trade was not so encouraging—at least in Europe, where consumers had by this time covered their requirements and were now holding aloof. It was better in America where electrical industry prompted an improved demand and producers had raised their prices gradually to 13⅜c. The London market improved in sympathy therewith to £62. Thereafter followed a distinct reaction primarily due to weakness in American shares and to slackening of trade inquiries. The closing prices were £59 17s. 6d. for cash warrants, and £60 5s.@£60 7s. 6d. for three months.

April opened with a flat market, holders having become impatient in face of the steadily growing production of the metal. For a time speculators absorbed offerings fairly well, and prices suffered only moderately; but reduced quotations from New York soon deepened the prevailing depression. Consumers were apathetic and business was restricted. American demand was further checked by recurrence of financial instability. On April 10 prices had fallen to £57 15s. cash, and £58 5s. three months; while leading American producers were readily meeting demand at 13c. for electro, and even this reduced price was undercut by some of the lesser producers. There were also rumors of wholesale reselling for Chinese account, some unshipped orders being certainly countermanded. The next feature was a recovery induced by covering of short sales, and a concerted buying movement which coincided with a bull campaign in copper mining shares, whereby values were carried up to £58 12s. 6d. and £59 respectively on April 16. On the resumption of business after the Easter holidays prices relapsed in a stagnant market, the turnover being small and mostly professional, while trade reports were generally discouraging. Toward the end of the month there was more activity, due chiefly to the desire to liquidate holdings in face of enormous shipments of the metal from Atlantic ports. Three months' warrants changed hands at £57 17s. 6d. on April 28. Thereafter occurred a transitory recovery caused by covering of May prompts and strong advances on the New York Stock Exchange. The trade, however, remained unresponsive and values fell away, closing at £57 10s. for cash warrants, and £58 2s. 6d. for three months.

May started with a fall of 10s. per ton, caused mainly by unfavorable statistics; but at the end of two days the selling pressure had subsided and a recovery of 17s. 6d. was recorded, due to buoyancy in copper mining shares and influx of speculative orders. The next feature was a reduction in American prices, which weakened the London market and brought back prices to the starting point. Toward the

middle of the month a well sustained bull movement was initiated in Wall Street, which created great activity in stocks and broadened so as to attract speculators toward the metal. Brokers—undeterred by actual conditions of trade—encouraged their clients to invest for the rise, and a large volume of business resulted. The expanded demand was met by heavy selling, supposed to be for American account. Cash warrants advanced from £56 15s. on May 12 to £59 on May 19; the three month's price being maintained throughout at about 15s. premium. Meanwhile producers were alert to take advantage of the improvement, and accepted in many cases prices which were well below the Standard parity, Japanese brands being prominent after a long period of inactivity. The consumptive inquiry meanwhile was far from satisfactory, manufacturers being unanimous in bewailing the scarcity of orders. Prices gave way at the first sign of reaction in Wall Street, and gradually fell to £56 17s. 6d. at which cash warrants changed hands on May 27. Thereafter cheerfulness was imparted by the termination of labor troubles in the shipbuilding industry, and by reduction of the Bank rate of interest from 3 to 2½ per cent. and the speculative movement again carried prices upward, the closing figures being £57 12s. 6d. for cash, and £58 5s. for three months. Manufacturers had meanwhile reduced their selling prices by £2 per ton, but without attracting much business thereby, and the general slackness of trade at home and abroad was very pronounced.

June was remarkable for the strength displayed by the market throughout the month in face of unfavorable statistics, poor trade, heavy offerings from Japan, unsettled and generally languid stock and share markets. There was sustained buying by speculative investors, who apparently regarded the future with confidence inspired by the improved industrial and political prospects in the United States. Leading producers were thus able to market their copper without conceding any substantial reductions in price, and were accordingly independent. The result was that fluctuations were very narrow; the three months' price ranging from £58 5s. at the opening, up to £59 5s. on June 11, and thereafter by easy stages down to £57 on June 29. The mid-monthly statistics were unfavorable and helped the decline. American sellers, after having sold fairly well early in the month, made some trifling concessions in price, but without attracting much business thereby. The disquieting feature was the steadily increasing stocks, not only in public warehouses, but also in the hands of producers; consumption meanwhile betraying a serious shrinkage, particularly in France and Germany. The support which the market received was, therefore, based more on sentiment than on sound economic conditions. Closing prices were £56 15s. cash, and £57 7s. 6d. for three months.

In July, prospects at the opening were not encouraging, trade being restricted and demand readily met by dealers. Statistics disclosed an increase of 6553 tons during the previous month, and stocks in private hands were heavy. Further shipments of the metal from the United States and from Japan promised to be heavy, and consumers were naturally reluctant to buy more than they actually required. Early in the month, however, speculation received an impetus from Wall Street where much optimism was imparted by prospects of a good harvest and by indications of expanding trade. The leading American producers of copper had meanwhile stood firm and now began to find a better home demand, and the London market improved in consequence. Three months' warrants, which had opened at £57 2s. 6d. changed hands in considerable volume at £58 12s. 6d. on July 9. Thereafter for a week or more operations were restricted and prices fell back a few shillings, the home trade being slack, though some improvement was noticeable on the Continent. On July 20 occurred a sharp rise in shares, whereby general optimism was revived; the sentiment soon extending to commodities, in which copper figured largely. Consumers now bought freely after a long period of abstention, and an industrial revival was manifest, particularly in electrical branches. Producers, having sold largely, held firmly for advanced prices, and the Standard market was correspondingly strong. Three months' warrants changed hands on July 24 at £60, a figure which had long been regarded as a remote possibility, and from which a temporary relapse of 5s. was soon recovered. American manufacturers bought largely at 13⅛@13¼c., apparently without satisfying their requirements even at the higher figure. The most noticeable feature in the Standard market was the absorbing power of the speculative demand, notwithstanding the poor support afforded by the home trade, which was adversely affected by the advanced prices. Bull accounts were freely liquidated, and bear selling assumed large proportions, while large quantities were marketed from Japan, Chile, China and European producers; but the speculative force absorbed all that was offered, and on the last day of the month £61 was paid for three months' warrants. This was the eve of the statutory holiday when the market would be closed for two days, and absentees would be numerous. The market closed amid diverse conjectures as to the immediate sequel, final quotations being £60 for cash warrants, and £60 15s. for three months.

In August when business was resumed the market displayed considerable buoyancy in spite of an increase of 4423 tons in the visible supply during the previous month. Prominent operators readily took over all that was offered by holders who naturally regarded the situation as unsound, in view of increasing stocks and diminished trade. The latter was indeed evident throughout the month, for consumers found orders few and were reluctant to buy the metal until obliged. Finance, however, was powerfully employed in keeping up prices of metals and of mining shares, and the cheapness of money contributed thereto. The situation was virtually governed by the New York Stock Exchange, while trade languished. American consumers found it necessary to cover accumulated requirements, and their purchases relieved producers of all superfluous holdings; and successive advances raised the selling price of electrolytic to 13¾c. Fluctuations on the London market were within narrow limits, the highest being touched on Aug. 10, when three months' warrants commanded £63, and the lowest on Aug. 25, when £60 7s. 6d. was accepted; and the month closed with a steady market, cash warrants at £61 2s. 6d. @ £61 5s., and three months at £61 17s. 6d.

In September the fortnightly statistics showed an increase of only 287 tons, which was generally regarded as favorable. Trade showed some signs of expansion, but the rising prices were checked by instability in the share markets. Consumptive inquiry mostly came from the Continent, where electrical enterprise was active, being chiefly manifest in the projected electrification of railways under the lead of the German government. Improved conditions in the iron and steel trades tended to inspire confidence, and prices rose until, on Sept. 8, up to £61 5s. was paid for cash warrants, and £62 5s. for three months. At this point the improvement was checked by the leading American producers unexpectedly reducing their price for electrolytic quality by £1 per ton. By the middle of the month recovery was in progress under the stimulus of buoyant share markets, but a relapse followed on the publication of statistics showing an increase of 3358 tons. American reports of trade and finance became less optimistic as the approaching presidential election engendered political excitement. Moreover it was known that production of the metal in the United States and in Mexico was now proceeding at full capacity and overtaking all previous records of output. By Sept. 22 prices of Standard had fallen to £59 2s. 6d. and £60 respectively. Thereafter the market improved for some days, but dealings were mostly professional and lacked trade support. The close was quiet, there being neither active demand nor eagerness to sell; cash warrants being held for £59 17s. 6d. and three months for £60 15s.

October found the market sensitive at

the outset, the continued increase in the visible supply inspiring caution. American consumers bought but sparingly pending the issue of the election, and the American producers found Europe their best outlet, particularly for electrolytic quality. In two days the London price dropped 12s. 6d. per ton. Grave political news followed, threatening war in southeastern Europe, whereby the share markets were much disturbed; but the copper market withstood the shock remarkably well. The lowest was touched on Oct. 9, when cash warrants stood at £59 2s. 6d. and three months at £60. Thereafter confidence was restored as political complications subsided and the share markets became buoyant, and prices advanced rather sharply, only to relapse gradually almost to the previous level. Trade generally was very slack, the electrical industries affording the only exception, and the increasing output from the mines gave promise of abundant supply. On Oct. 21 a recovery set in, due primarily to increasing firmness in Wall Street, and the price of the metal advanced £2 in two days. Producers' firmness contributed to this more than immediate demand; but with an improving demand from India and increasing evidence of the early electrification of continental railways, sentiment rapidly favored the rise which thereafter was gradual but steady. Toward the end of the month there were persistent reports of a powerful syndicate operating in support of the market. The rumor was not visibly substantiated, but it coincided with successive advances in the American price of the metal and a general improvement in the European demand. The month closed with a firm market, in spite of heavy realizations of speculative holdings, and with sentiment distinctly optimistic. Closing values of Standard were £61 15s. for cash warrants, and £62 12s. 6d. for three months.

November opened quietly under shadow of the impending election in the United States. The result was known on Nov. 4, and was the signal for a moderate improvement in values in the London market where, by Nov. 9, cash warrants commanded £65 2s. 6d. per ton, and three months' £66 5s. New York prices advanced more rapidly and touched 14⅝c. for Lake Superior brands, the consumptive inquiry being apparently unsatisfied even then. The speculative element was equally active, and was responsible for some reaction from the foregoing figures, particularly toward the middle of the month when profit-taking coincided with instability in the share markets. American prices of the metal also relapsed, but this was due to concessions made by dealers, producers having sold too largely to allow of any abatement of their prices. Offerings, however, were readily absorbed, and evidence of expanding trade were everywhere apparent. The lowest was touched on Nov. 23, when cash warrants changed hands at £62 12s. 6d. and three months at £63 12s. 6d. At this level influential support was forthcoming, and carried values up to £64 2s. 6d. and £65 respectively on Nov. 25, after which values receded a few shillings, but with strong undertone due to improved trade purchases and general optimism in regard to the next year's prospects. Closing values were £63 17s. 6d. for cash warrants, and £64 15s. for three months.

December was clouded at the outset by sinister political developments, as also by instability in the stock and share markets, while the approaching holidays and cessation of work during stock-taking tended to further restrict the consumptive trade. There was considerable liquidation of holdings—chiefly by continental sellers—early in the month, and prices fell back in consequence; but the market showed great power of absorption and was at no time demoralized. The lowest was touched on Dec. 8, when £62 2s. 6d. was accepted for cash warrants, and £63 2s. 6d. for three months. Producers were firm in maintaining their prices, and American advices were generally encouraging, though dealers occasionally shaded their prices. Speculative enterprise raised London prices to £63 7s. 6d. cash, and £64 7s. 6d. for three months, on Dec. 10; but at this level sellers predominated and caused a gradual relapse during the next few days to the extent of £1 per ton. At this time vague rumors were heard of a projected combination of the leading American producers to regulate the price and otherwise to steady the market. Trade generally was slack, and manufacturers apathetic; but underlying conditions were considered hopeful and values were well maintained. The closing quotations were £63 15s. for cash Standard.

The London Lead Market in 1908

SPECIAL CORRESPONDENCE

January found metals generally in improved demand and a tendency toward higher prices. There was considerable covering of bear sales in lead, £14 15s. per ton being paid for forward delivery, and consumptive demand was brisk until checked by the higher figure. Thereafter a few selling orders sufficed to depress the prices down to £14 on Jan. 9, whereat buyers showed renewed interest, and a fair volume of business was recorded. About Jan. 20 large speculative purchases were made, coincidently with bull operations in certain mining shares; and the price was again carried up to £14 15s., but again not maintained thereat. A temporary relapse, however, was soon recovered in virtue of active business which gradually raised the price to £15 5s. This figure induced realizations, followed by some easing of the price. Consumers' demand slackened, but with every indication of large requirements to be covered and stocks everywhere small. The closing prices were £14 17s. 6d. for foreign brands, and £15 2s. 6d. for English.

February found the London market active, but with few inquiries from provincial consumers, and these were readily met by cheap offers from America, and values receded accordingly until, on Feb. 12, spot parcels commanded only £14 2s. 6d. This figure attracted some speculative attention and a temporary rally of a few shillings. Heavy arrivals induced renewed depression, consumers holding aloof, and £13 13s. 9d. was accepted on Feb. 27. Thereat buyers showed more interest, and a fair volume of business took place at improving prices which, at the close, stood at £13 17s. 6d. for foreign brands, and £14 2s. 6d. for English.

In March, the tendency was rather strong at the opening, £14 3s. 9d. being paid for forward delivery; but prices receded on spot metal being pressed for sale. This touched £13 12s. 6d. on March 4, but thereafter holders were unwilling to sacrifice parcels at so low a level, and the price hardened to £14. Buyers, however, were intimidated by the plethora of prompt metal, and gave but meager support, whereby values were reduced by a few shillings until March 17, when a gradual recovery set in, prompted by the absorption of spot parcels and an influx of Russian orders. The improvement lasted until March 25, when £14 12s. 6d. was paid for forward delivery; but at this point speculative holdings were liquidated and support was lacking. Prices quickly receded to £14 5s.@£14 7s. 6d for foreign brands, and £14 7s. 6d.@14 10s. for English, at which figures the market remained uneventful for the rest of the month.

April showed a gradual and almost uninterrupted decline in values. Opening with foreign brands from £14 2s. 6d.@£14 7s. 6d. the market was depressed by the forced sale of numerous arriving parcels, consumers' demand being meager and readily met by keen sellers. Only on April 28, after £13 had been accepted for prompt delivery, did an improvement set in, raising the price to £13 5s. for prompt delivery and £13 10s. for July and August, English brands being quoted £13 10s.@ £13 15s. The month closed thus with a rather improved demand.

May was uneventful, with narrow fluctuations and only moderate consumptive demand. The market opened rather easier at 13 2s. 6d. for foreign brands, and £13 7s. 6d. for English. It developed some little strength toward the middle of the month, chiefly for forward delivery; £13 7s. 6d. being paid for foreign brands deliverable in July. On May 21 a decline set in, prompted by pressure of early arrivals in a market unsupported by trade demand, until in one case £12 15s. was accepted. The closing days of the month witnessed

a slight improvement, final quotations being £12 17s. 6d.@£13 2s. 6d. for foreign brands, and £13 2s. 6d.@£13 7s. 6d. for English.

June opened very quietly, consumers being reluctant to buy in view of the approaching Whitsun holiday. Foreign brands opened at £13, and receded to £12 12s. 6d., then stiffened moderately, but with little business passing. It was not until June 29 that any activity was manifest, when forced realizations brought the price down to £12 6s. 3d. for prompt delivery, and £12 10s. for September. This level proved attractive to buyers, and a fair volume of business took place. Closing prices were £12 6s. 3d. for July foreign and up to £12 12s. 6d. for extended delivery, English brands being held for £12 12s. 6d. to £13, according to time of delivery.

July found the market ripe for moderate improvement, partly in sympathy with other metals, but more in consequence of reduced selling pressure. Consumptive inquiry was fair throughout, and the improving tendency was manifest in higher prices paid for forward delivery than for spot lots. Toward the close of the month activity was very general both in Europe and America. The result was a slow but persistent improvement of about 15s. per ton from the outset to the close; final values being £13 7s. 6d. for foreign brands, and £13 10s. for English.

August found supplies under strong control and not likely to be pressed for sale. The gradual improvement in values continued until £13 15s. was paid. On Aug. 11 the metal markets generally showed weakness, and lead was found vulnerable to the attacks of bears, while consumers judged well to hold aloof. A reduction of 5s. eventually brought out a fair volume of business, but prices gave way further as demand was satisfied. Fluctuations were at no time important, and the month closed with a quiet market; foreign brands being quoted £13 5s.@£13 6s. 3d.; English £13 7s. 6d.@£13 10s.

September was an uneventful month, prices fluctuating within very narrow limits. Business was restricted at the outset, but showed early signs of revival as manufacturers came forward to replenish their depleted stocks. Russian and other continental demand coincided with restricted supply and tended to keep the market firm. Prices hovered between £13 5s. and £13 1s. 3d. until the closing days of the month, when available supplies were insufficient to meet the demand, and inquiries were more frequent. Final values were £13 7s. 6d. for foreign brands, and £13 10s. for English.

October was uneventful on the whole, and fluctuations were narrow. English consumers bought moderately, and there was steady demand from Russia and other continental countries. Some scarcity of prompt supply raised the price to £13 15s. early in the month, but the scarcity was soon relieved, and was followed by some depression consequent on political complications in southeastern Europe. The lowest touched for foreign brands was £13 5s. Later in the month prices stiffened on the news of labor trouble threatened at the Broken Hill mines; and with help of speculative buying, values rose to £13 10s. for foreign brands and £13 12s. 6d. for English, whereat the month closed.

November opened with a strong market, particularly as regards forward delivery. Speculative interest was aroused, and was further stimulated by rumor of increasing labor troubles at the Broken Hill mines. Up to £14 5s. was paid on Nov. 11 for forward delivery. Consumptive inquiry, however, was disappointing, its shrinking being largely due to slackness in the building trades. Later in the month prices were depressed by heavy arrivals in excess of requirements, and by adverse speculative operations. Confidence in the early revival of trade in the building and electrical industries helped to maintain relatively high prices for forward delivery; but the general trend was downward, and closing prices were £23 2s. 6d.@£13 5s. for foreign brands, and £13 5s@£13 7s. 6d. for English lead.

December opened with a depressed market consequent on heavy arrivals of the metal which at one time commanded no more than £13 2s. 6d. Thereat, and at a few shillings more, bears covered their sales, consumers bought moderately, and producers became independent. An improvement of 5s. per ton ensued, but was of short duration, the slack season tending to weaken a market only poorly supported. The undertone, however, was fairly good owing to the prevailing optimism regarding trade for the ensuing year. The closing price was £13 for foreign and £13 2s. 6d. for English lead.

The "Step Process" for Treating Iron Ores

From time to time articles have appeared in local papers with regard to a new process for treating iron ore devised by John T. Jones, of Iron Mountain, Mich., which was to "revolutionize" the iron and steel business. These articles, however, contained no definite information as to its exact nature. For the first critical and authoritative description of the process, which possesses considerable interest, we are indebted to the *Iron Trade Review*, of Cleveland, Ohio. It is known as the "step process," though the inventor calls it the "Ardis furnace."

The Step Process

Up to this time, all of the operations of the furnace have been purely experimental both as regards the mechanical and chemical problems to be worked out. These experiments have not involved the principles upon which the process is based, but have had to do with the regulation of temperatures, speeds and gearing, and the character and operation of the gas producer. Now it is claimed that a sufficient tonnage of ore has been successfully put through the furnace to establish the correctness of the principles involved, the economy and practicability of the process and the rate at which the product may be shipped.

The plant comprises principally a horizontal rotating furnace and a gas producer. The process consists of the reduction of the metallic oxides of any ores to the metal and applies, therefore, to copper or zinc oxides as well as iron. As applied to iron ore, for the reduction of which this furnace was particularly designed, the process yields a product which may either be charged into an ordinary "balling" furnace and thence to the familiar squeezing rolls and blooming mill to be made into muck bar, or it may be put into the open-hearth furnace, in place of scrap, to be manufactured into steel. The plant now erected and the operations so far carried out have to do only with the metallizing of the iron oxide. Beyond this step the operations are not new and have been successfully conducted for a long time. In the future of the project, it is expected to introduce at this plant the other operations and ship, from the immediate vicinity of the ore mines, only the finished product. The commercial success of the undertaking, therefore, carries with it, if it materializes, very great possibilities.

The Furnace

The furnace consists of a steel tube 8 ft. in diameter and 120 ft. long, lined with firebrick and very similar to the ordinary cement kiln. It is mounted almost horizontally with a slight inclination toward the discharge end to aid in the movement of the ores. The tube is equipped with two bearing rings and is supported on rollers mounted on concrete piers. A spur-gear ring encircles it by means of which and a train of gears driven from an electric motor, the furnace is rotated at the rate of one revolution a minute. The ore is brought in on a railroad track which parallels the furnace and is dumped from hopper-bottom cars into the boot of an elevator which raises the ore into a headframe at one end of the furnace. Here it is discharged into a rotating screen with a ¼-in. mesh. That which passes the screen is ready for charging into the furnace and the lumps are carried up to a crusher which breaks them down to the same size. The ore thus prepared is charged into the kiln.

The Gas Producer

At the other end of the furnace the gas

producer is erected. This is an ordinary water-sealed gas producer using any kind of bituminous coal and evolving a rich hydrocarbon gas. This gas is admitted into the end of the kiln in excess. Air is admitted through a slip ring or bustle-pipe which encircles the kiln close to this end. The mixture results in a combustion which produces the necessary heat in the kiln and the excess hydrocarbons reduce the oxide in the ore. The reactions are similar to those in the upper zones of the blast furnace except that the source of the carbon is different and, in the experiments so far, the temperatures have been about the same. It is understood, however, that some developments have operated to suggest a change in the temperature at which this reduction can be brought about. The operation in this furnace does not go far enough to carburize the metal and the product is practically as free from carbon as was the ore.

The Product

The product in appearance is similar to some specimens of sintered blast-furnace dust. It is hard and porous and when worked with a file shows clearly the metallic character of the sponge iron. In the product the metal is intimately associated with the gangue of the ore, largely silica. This is not affected by the process, but it has been found consistently that the phosphorus content is reduced in the operation. No explanation of this phenomenon is attempted. While sulphur is not at all troublesome in Lake Superior ores, it could be easily roasted out at the temperatures under which the kiln operates. The ore that has been used came from the Mitchell mine on the Marquette range. This is a high-grade ore and the silica content of such ore would have but little importance whether the product were used for making iron or steel. One of the possibilities which this process is expected to develop, however, is the use of low-grade, high-silica ores. This kind of ore, running in the neighborhood of 40 per cent. in iron and 30 per cent. in silica, abounds in the immediate vicinity of Iron Mountain and Antoine, where the furnace is located, and a large percentage of the ores of the eastern end of the Menominee range are of like character. The promoters of this furnace have secured an interest in the ores of the Randville district, a high-silica territory only a few miles from Iron Mountain, so that the freight on the ore delivered at the furnace should be not over half of the rate now charged for hauling from the mines to Escanaba. The crushing of the ore also for this furnace is no more than has to be done with a number of the ores from this district now, in shipping for blast furnace use.

With a large percentage of silica in the ore, however, there will be a corresponding percentage of this furnace product to be slagged off in the balling furnace. This will undoubtedly carry off some iron with it, just how much is a question, although this trouble would seem quite possible of remedy. Where the product is to be used for charging into open-hearth furnaces, the silica will be most objectionable and the added cost of treatment either by a compound acid-basic operation or otherwise is problematical.

General Conclusions

No general comparative statement of costs can be given at the present stage of operation. It is claimed by the inventor that it is possible to turn out the product at a cost of not more than $1.50 per ton. If this estimate is reliable, and if the product of the furnace can take the place in the manufacture of muck bar and steel that is claimed for it, it is apparent that even at plants far removed from Iron Mountain, pig iron and scrap, respectively, can easily be supplanted in these processes.

In brief, the claims made by the inventor are that the furnace will obviate the need of steel-making pig iron and the blast furnace producing it. It will render unnecessary the decarburizing portions of all steel-making processes and, most important, it will result in the restoration of wrought iron to common use. It is hardly necessary to add that much further work on a commercial scale is necessary before these claims can be fully accepted.

J. C. Buckbee & Co., Chicago, are the constructing engineers for the plant; the furnace, crusher and driving motors were built by the Allis-Chalmers Company. Current for driving the motors, which are five in number and respectively 75, 40, 30 and 5 in size, is supplied by the Iron Mountain Electric Company.

Railroad Rates on Iron and Steel

Special Correspondence

A complaint filed with the Interstate Commerce Commission by the Babcock & Wilcox Company against the Atchison, Topeka & Santa Fé railroad, the New York Central & Hudson River, the Lake Shore & Michigan Southern, the Pennsylvania and the Central Railroad of New Jersey raises some points regarding the transportation of iron and steel products which are likely to be of considerable significance when a decision has been rendered. The complainant is a corporation with works at Bayonne, N. J., while the rates complained of are those affecting transcontinental traffic and specifically shipments to Redondo, Cal. The schedule as published by the Atchison, Topeka & Santa Fé in a joint tariff designated by the commission as No. 375, and by the road as 5970, shows rates from New York, Boston, and common points (of which Bayonne is one) including the following provisions: "Boiler heads or ends, flanged, minimum carload 30,000 lb., $1.10 per 100 lb. Castings N. O. S. plain, as from sand, in no way hand or machine-finished except being drilled with bolt holes O. R. B. minimum carload 30,000 lb., 85c. per 100 lb. Articles of iron or steel O. R. wet or rust angles, channel beams, columns and girders, minimum carload 30,000 lb., 85c. per 100 lb." Prepaid shipments having been made from Bayonne to Redondo under these provisions the roads concerned declined to give up the goods at the California terminal unless additional freight under the same rating as that for boilers was paid. The assigned reason was that the boiler heads, rough castings, etc., shipped were ultimately intended for the construction of boilers and hence should take the rate published for boilers. Further, the roads declined to accept further shipments under this tariff for the same reason. The complainants ask for an order requiring the roads to accept rough iron and steel products at the published rate independent of their ultimate use.

Dredge Mining and Hydraulic Sluicing in Victoria

D. B. Sellars. the engineer in charge, reports (*Monthly Mining Report*, June 28, 1908) that the number of gold-dredging and hydraulic sluicing leases in force in Victoria on Dec. 31, 1907, was 323, the systems in use being: Bucket, 45; hydraulic pump sluice, 84, and jet elevator, 4.

One pump-sluice plant dealt with 12,200 cu.yd. of material in a week and five others from 10,000 to 11,000 each. The depth of ground worked varied from 6 to 62 feet. Forty-five bucket dredges in 1599 weeks raised 10,371,852 cu.yd. of material yielding 41,085 oz. gold. Eighty-four pump hydraulic sluices in 2092½ weeks dealt with 9,670,362 cu.yd. of over-burden and wash-dirt, yielding 55,272 oz. gold. Four hydraulic jet elevators in 76 weeks put through 157,678 cu.yd. of alluvium for a return of 1464 oz. gold. The total area worked by these 133 plants was 739 acres, the average yield 132.3 oz. gold per acre, and the number of men employed 2468.

Six plants using hydraulic sluicing by gravitation in 86 weeks handled 396,116 cu.yd., yielding 2394½ oz. gold. The total quantity of material treated during the year by dredge and hydraulic sluice mining by gravitation was 20,596,008 cu.yd., the gold obtained being 100,216 ounces. This branch of the mining industry shows an increase of 12,550 oz. as compared with the previous year.

Concluding, Mr. Sellars says that the introduction of some cheap, rapid, non-injurious and efficacious precipitants for the clarification of sludgy water would be of great benefit.

The Virginia & Mexico Cyanide Plant

By Mark R. Lamb*

The Virginia & Mexico Mining and Smelting Company, under its general manager, Jesse Scobey, is building a modern cyanide plant at Hostotipaquillo, State of Jalisco. Mr. Scobey has had an extended experience in the States and in Mexico, and has brought together a plant combining the best features of accepted practice. The plant is being built in a mill formerly occupied by a lixiviating plant, which is so large that most of the cyanide equipment will be under cover. The question of power is still an open one in the district, though reports appear with great regularity that power from lake Chapala will be distributed over the entire State. The Oedro Analco power proposition contains possibilities of power for this entire district, and as the dam is already built this seems to be the probable solution of the question.

The extension of the Southern Pacific from the coast to Guadalajara will greatly help this section of Mexico, and as the Federal Government has declined to extend the time for completion of the railroad, work is being crowded in order to complete the road within the time limit.

The machinery for the Virginia & Mexico company was shipped by steamer from the United States to Tampico, and thence by rail to Etzatlan. From here it is packed on mules over the mountains to Hostotipaquillo. All this machinery is now at Etzatlan, on the trail, or at the mill, so the initiation of the plant will not now be long delayed.

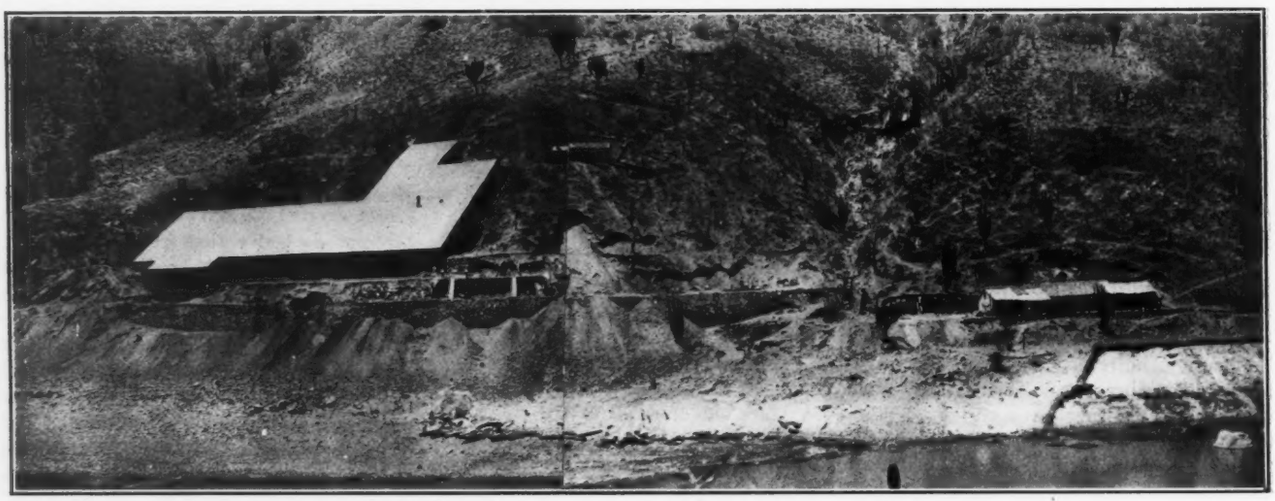
The ore, after careful sorting, will be crushed in Blake breakers and fed to 30 stamps, crushing in solution. Wilfleys will remove coarse concentrates. The tails from these will go through dewatering cones to two 16-ft. tube mills and then to a second set of Wilfleys for further concentration of the fine sand. Sand collectors with Butters-Mean distributers take the tailings from the second bank of concentrators, sending the slime to storage and air-agitation tanks, and the sand in cars to the leaching tanks. Slime will be washed in a vacuum filter of ample capacity, and solutions precipitated on zinc shavings, the bullion being melted rather than shipped as precipitate. One feature in the mill is given consideration which is usually overlooked. Emergency sumps are provided for accidental overflows. These occur in the best regulated mills, and wilfully ignoring the inevitable, usually result in the monthly loss of more than the cost of the necessary extra tanks and pumps with cement floors and drains. No plant milling in solution should be built without a complete system of such floors and drains.

The usual difficulties of mill construction are more than doubled by the difficulties of getting sectionalized machinery such as is required in this mill, followed by the difficulties of getting prompt transportation. An inquiry for delivery on a sectionalized pump will bring a reply from the manufacturer asking if the base, weighing 1200 lb., is too heavy for one piece. I wonder what kind of mules they think grow in Mexico?

In the illustrations two methods of transporting machinery in this district are shown.

WILFLEY TABLES ON BURRO BACK

PEONS PACKING IN MACHINERY



STAMP MILL AND CYANIDE PLANT, VIRGINIA & MEXICO MINING AND SMELTING COMPANY

*Mining engineer, Mexico City, Mexico.

The output of copper ore in the United Kingdom in 1907 was 6792 long tons, against 7758 tons in 1906. In 1863 the production of ore and precipitate was about 210,000 tons, valued at more than £1,000,000.

Mining Legislation in Congress

SPECIAL CORRESPONDENCE

Several bills have been introduced in Congress at the present session, which affect mining interests. Among these the following are noted:

REGULATING HYDRAULIC MINING

A bill (H. R. 25,547) relating to the regulation of hydraulic mining by the California Débris Commission has been introduced by Representative Englebright and referred to the committee on Mines and Mining. The bill provides that the California Débris Commission (created under the act of Congress of 1893) shall make an estimate of the number of cubic yards of mining débris or solid material that will eventually be carried into the navigable rivers or streams of California either through the operation of a given mine itself, or by escaping from the impounding basin appertaining to the mine. The commission shall then, under rules and regulations to be approved by the Secretary of War, provide for the issuing of a license or permit for the working of the mines and for the removal of the débris or an equal amount of solid material by those who are responsible for its being disturbed from the original places of deposit. The commission may, however, instead require the payment to it by the mineowner of the net cost of removing such solid material from the navigable streams; and the commission is to be empowered to expend all moneys received in this way from mineowners in dredging and improving the navigable streams affected, or their tributaries. In the event that the mineowners elect to remove the débris themselves, the commission may indicate to them the point or points at which the removal shall be made. The license for the removal of solid material from navigable rivers may be issued directly by the commission to those who already have licenses to mine by hydraulic process; but in the case of future applications for licenses the issue shall take place only in accordance with the new regulations to be made up and aproved by the Secretary of War.

SURVEYS OF MINERAL LANDS

The following bill (H. R. 25,396) for the relief of applicants for mineral surveys has been introduced by Representative Needham of California:

"That the Secretary of the Treasury be, and he is hereby, authorized and directed to pay, out of the moneys covered into the Treasury from deposits made by individuals to cover cost of work performed and to be performed in the offices of the United States surveyors-general in connection with the survey of mineral lands, any excess in the amount deposited over and above the actual cost of the work performed, including all expenses incident thereto for which the deposits were severally made. Such repayments shall be made to the person or persons who made the several deposits, or to his or their legal representatives, after the completion or abandonment of the work for which the deposits were made, and upon an account certified by the surveyor-general of the district in which the mineral land surveyed, or sought to be surveyed is situated and approved by the Commissioner of the General Land Office."

The Lick Branch Explosion

At 8:30 on the morning of Jan. 12, a second explosion occurred at the Lick Branch mine, of the Pocahontas Consolidated Collieries Company, in southern West Virginia. It will be remembered that 51 men lost their lives in this mine on Dec. 28. In this latest disaster, it is believed that 105 miners have perished.

All of the bodies so far recovered were badly burned and identification of the men has been made by means of effects upon their persons. The force of the explosion shook houses for half a mile around and windows were blown out of many buildings.

Mine Foreman Bowers, who was near the entrance, was blown from his feet by the explosion, but managed to crawl out safely, as did also Robert Smith, a miner. The main entry of the mine is four miles long, running from one side of the mountain to the other. Débris was blown from both entrances, which gives an idea of the tremendous force of the explosion. The fans which furnish ventilation for the workings, as in the former explosion, were not disabled, and are forcing fresh air into the mines.

A train was rushed from Bluefield to the scene of the disaster, carrying bratticing and other material to be used in the work of exploration and rescue. The débris from the explosion of two weeks ago had not been cleared away and twenty men were engaged in this work. Nineteen contract miners with their crews were at work in a new entry, and it is feared that all of these men were lost.

The majority of the miners employed in the workings were Americans. The last body of the 51 victims caught in the December explosion was brought to the surface only last Friday, Jan. 8.

According to *Le Génie Civil*, Oct. 10, 1908, a mixture of kaolin and less than 80 per cent. chromite is more fusible than pure kaolin. To obtain maximum refractoriness, the mixture should contain not more than 10 to 15 per cent. of the clay. The fusion point of a mixture containing about this amount of clay is said to be higher than that of platinum.

Joseph Wharton

Joseph Wharton, the largest individual iron manufacturer in the country and a man of varied experience and attainments, died at his home at Branchtown, near Philadelphia, Jan. 11, aged 83 years. He was born in Philadelphia in 1826; entered business as clerk in a mercantile house in 1845; afterward engaged in the manufacture of white lead; and in 1853 organized the Lehigh Zinc Company, for which, in 1860, he built the first successful spelter works in the United States. In 1873 he bought the Gap nickel mines in Lancaster county, Penn., and then established at Camden, N. J., the first successful nickel and cobalt works in the United States. He then entered the Bethlehem Iron Company, subsequently the Bethlehem Steel Works, founding there the first armor plant in the United States. He retired from this company when it was reorganized. Meantime he had become largely interested in iron mines and blast furnaces in New Jersey, acquiring the iron deposits at Hibernia, Andover and Wharton. He had three blast furnaces at Wharton and Philipsburg, with a capacity of 600 tons a day. He also bought and operated coal mines in Indiana county, Penn. His activities, which continued almost to the day of his death, were many and various. He was for 12 years president of the American Iron and Steel Association. He was also a large owner and active director of the Lehigh Valley railroad until a year ago, when he retired. He was a director of the Farmers and Mechanics' National Bank and had also been a director of the International Nickel Company, which absorbed his nickel properties. In addition he was a frequent writer on industrial and scientific topics, and took a deep interest in education. Some years ago he founded the Wharton School of Finance and Commerce of the University of Pennsylvania, which he endowed with $500,000. He leaves a fortune estimated at $25,000,000, chiefly invested in lands and industrial enterprises. He always conducted his business as an individual, but in 1907, as a provision for the future, he organized the Wharton Iron Company, to hold his iron properties.

Small air hoists mounted on a bar are used in some of the mines at Mount Morgan, New South Wales, Australia. These are easily put up, the bar being placed vertically, and are used instead of a windlass in sinking winzes. These hoists are simple in construction, are light and can be moved easily.

In order to obtain the best results in an upcast shaft all crosscuts above the levels being worked should be blocked off in order that cool air may be prevented from entering the upcast shaft and so decreasing the natural ventilation.

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The Situation in Copper

Ever since the development of the Bingham and Ely mines was begun we have been talking about the great increase in copper production to come from those places. The debâcle in the winter of 1907-08 diverted attention from what was impending and consequently the great increase in production in 1908 that we reported last week, which occurred in the face of what is called a "low price" for copper burst upon most persons as a surprise. There are indeed surprising features in the statistics, chief of which is the failure of a 13¼c. average to restrict more severely the output of the small mines, whose aggregate made a handsome total in 1907. Alaska, Idaho and New Mexico did, in fact, suffer in 1908, but Wyoming, Missouri and Virginia held their own, while Colorado made a respectable increase. Vermont receded, but only temporarily pending the beginning of smelting by the Vermont Copper Company. Many of the small mines are, therefore, still able to live. This being so, the increases in the big camps were all clear gain.

In Arizona—Bisbee, Globe, Clifton and Jerome made increases, in some cases very large ones. At Butte, in spite of the shutdown in January and February, there was a gain of 29,000,000 lb. The great expansion of operations by the Mammoth swelled the output of California. The enlarged output of Nevada is, of course, explained by Steptoe Valley. The extension of the Garfield works in Utah made good the deduction of the United States, Bingham and Highland Boy smelters, and the Utah, Boston Consolidated and Utah Consolidated mining companies glutted it with ore. Indeed, the production of the mines in 1908 was doubtless larger than the production of the smelters, many of our reports showing much more copper received in ore than turned out as blister.

During the first part of 1908, Anaconda, Cananea, and three of the works at Salt Lake were idle. At that time production was below the rate of 1907. Anaconda resumed in March, and Cananea in the second half of the year. In the second half the Ely copper began to appear, and the porphyry mines of Bingham put additional capacity into operation. The Arizona districts and Lake Superior produced steadily right along. Lake Superior made about the same output as in 1907.

It is doubtful as to the refineries, which are at least two months behind the smelteries with respect to delivery of the finished product. In the early part of 1908 the refineries were operating at reduced capacity. They did not attain full capacity until after the blister copper of Washoe, Steptoe and Cananea began to reach them. This implies a smaller production from the refineries than from the smelteries and it is probable that the refinery production of 1908 was less than the refinery production of 1907.

For the reason that we are not yet in possession of the refinery statistics, it is impossible to determine what the deliveries for domestic consumption and the unsold stock at the end of the year amounted to. The exports were large—about 664,000,000 lb., against 509,000,000 in 1907. The deliveries for domestic consumption are thought to have been upward of 400,000,000 lb. (against 539,000,000 in 1907, and 668,600,000 in 1906), but how much above that figure there are not yet data to show. At the beginning of 1908 there was about 120,000,000 lb. of refined copper in stock at the American refineries. At the mid-year the stock was believed to be fully as large. Some large sales were made in the second part of the year, but the present production of North America necessitates the disposal of nearly 4,000,000 lb. of copper on every business day on the average. It is well known that much of the copper exported has gone into stock abroad, where the visible supply is the largest for many years. There can be no doubt also as to the existence of an unsold stock on this side, but whether larger or smaller than at the beginning of the year cannot be safely pronounced. The visible stock in Europe at the end of 1908 was 124,723,200 pounds.

Yet the stocks on both sides of the Atlantic are of no such magnitude as to cause concern, if only consumption would regain its normal rate. The world's production of copper is now upward of 720,000 metric tons per annum. Assuming the consumption to be equal to the production, which is the case in the long run, about 60,000 tons per month are required. Consequently, the present stocks in Europe and America are only about two months' supply. It is misleading to compare present stocks with those of 10 or 20 years

ago when consumption was much smaller. In those former times it was recognized that two months' supply for the world was no more than is normally required as a safety reserve; if stocks were to be absolutely depleted, we should see such runaway markets, with their inevitable mischief, as we had in 1906-07.

It is the recognition of the soundness of this reasoning, together with their confidence in the march of business revival and the easy money market that has lately made producers act so stiffly, most of them being in a comfortable position. Although they have had at times to whistle to keep up their courage, they feel that they have successfully steered their craft amid reefs, shallows and breakers, and are now in comparatively smooth water. After all, 1908 was not a bad year, except to the wildcatters and the owners of so-called mines that are mines only when copper fetches 18 or 20c. The average price for copper in 1908—about 13¼c. is nearly 2½c. below the average of 1898-1907, but that decennial average is inflated by the extraordinary prices of 1906-07. If the latter years be excluded, the average for 1908 is only a trifle lower than the previous decennial average. A large proportion of the copper of North America is produced at a cost of 10c. and under, meaning the real cost which includes all development, depreciation and maintenance charges.

As to the prospects for the near future: Production is now going on at the largest rate in the history of North America and it is increasing every day. This is largely a matter of smelting capacity. Nearly all of the new works begun in 1906-07 have now been completed, but some have not yet gone into operation. Steptoe and Cananea are just beginning to get their full gait; also Bully Hill and Balaklala. Teziutlan is to start in February. The Imperial works released smelting capacity at Douglas. Humboldt did not operate in 1908, but is likely to do so this year; also the works of the United States Smelting Company near Salt Lake. The installation of converters at Yampa in 1908 added to the capacity of Utah, which will be further increased in 1910 by the Tooele plant. It does not seem as if there would be any scarcity of copper. Given an increasing production the market will be determined by the needs of the consumers. Business is undoubtedly improving, but still very slowly. Some conditions lead to the belief that the revival in 1909 will not be so extensive as has been anticipated by the optimistic. It would not be surprising if the course of the copper market in 1909 should be on somewhat the same lines as in 1908.

Expert Advice

We have received a letter upon which we may base a word of advice, although in substance we have given the same many times previously. The letter is as follows:

"Will you please inform me where I can obtain some advice respecting an investment in a new gold mine in the * * * district of Colorado. I cannot afford to pay very much, because my investment will be only a small one in any case, but I cannot afford to lose my principal, and I should like to obtain some sound advice at a small cost. The mine is not a speculative offering (i.e., it does not figure in the stock market) but is owned by a few friends of mine who have excellent expert reports upon it and expect great things from it. It seems to me to be a good investment, but as I said in the first place, I feel that I ought to have advice of my own before risking my principal."

Our correspondent displays an intelligent recognition that mining is a business of which he is ignorant, and while offering attractions for investment, he ought to have professional advice. If every investor were so thoughtful and careful, the days of the wildcat promoter and the enthusiastic ignoramus and the visionary amateur would soon be numbered. The question is how can the small investor obtain good professional advice, the services of a competent engineer being necessarily costly? This difficulty is met ordinarily by the responsible banking houses, which are able to pay for the proper professional advice and pass it on to their clients with their own indorsement. In this way the banking houses which make a specialty of mining investments perform a valuable service. Their work is promotion in the highest sense of the term, and the profit which they realize is well earned. In all respects they are important and valuable members of the business community. The investor must, of course, learn to distinguish between the substantial houses of this class and the pinchbeck concerns which ape them.

However, these operations fall far short of covering the ground. There are many cases, in all respects legitimate and praiseworthy, like that which is mentioned by our correspondent. To him, and others in a similar predicament, we can offer only these suggestions: Employ an engineer resident near the mine in question, who can examine it at less expenditure of time and money for traveling than one who would have to go out from Chicago or New York. Let two or more prospective investors club together to pay the bill. Take care to obtain a reliable recommendation as to the local engineer. If necessary, pay some other engineer, known personally or by reputation, for such a recommendation. Proceed, in brief, in very much the same way as if it were a matter of securing legal assistance to be rendered in a remote place.

The Verdict on the Marianna Explosion

Under present conditions it is hopeless to expect any beneficial result from the investigations of coal-mine explosions by the coroner and his jury. The questions asked of the witnesses at the inquest are usually of such a nature and so framed that no one will be embarrassed. Any evidence that is likely to incriminate the mine officials, or place the responsibility upon the living, is either concealed or carefully avoided.

We do not question the truth of the statement that in the majority of instances the miners themselves are to blame, and that with their lives they pay the price of such carelessness; however, in many cases, the mining company is directly to blame, and in almost all instances the mine officials are responsible for the accidents because they have permitted their employees to violate rules and mine coal in a reckless manner. If the miner who is guilty of disobedience were alone to pay the price for his negligence, the question would not be so serious; however, in all cases, the innocent suffer with the guilty.

No mining official can cleanse his soul from the stains of censure simply because the coroner's jury renders a verdict, stating that disregard of rules on the part of some miner was responsible for the lives lost. It is not enough to formulate rules and ask that they be obeyed; it is the duty of those in authority to see that they are obeyed.

The Marianna mine, as we have before stated, was designed to become a model operation. The plan of the workings as originally mapped out for guidance in the development work, was as nearly ideal as present knowledge of conditions in the Pittsburg field permits. Excellent rules were established, and the precautionary measures were of the best.

The coroner's jury brought out the following facts: 1. The mine contained gas. President Jones stated that about 2 per cent. was the maximum amount found in the workings at any time after the fan was installed. 2. Official instructions had been issued requiring that the miners use only fulminate powder in putting off shots. This rule was later modified and miners were permitted to use carbonite powder in places where the holes were wet. The use of black powder had been absolutely forbidden. 3. After the explosion, it was found that some of the miners had been using black powder, and a can of this explosive was found in one of the entries. 4. The dust was sprinkled down before shots were fired at the working faces. 5. The fan's indicator card showed that the fan stopped at 10:30. 6. Mixed lights were used in the mine. 7. It was found that there had been instances of gross violation of the rules, and recklessness on the part of the miners. 8. In some instances coal dust had been used in tamping. A cartridge to be used in tamping was found filled with slack and dust. 9. The explosion occurred at 10:54 in the morning.

The above statements of fact comprise the important evidence submitted at the inquest. The jury which sat on the case was composed of five farmers and one machinist. The verdict of these worthies was that the explosion was due to a blown-out shot in Blanche entry No. 3, which ignited the gas and dust, and that a secondary explosion occurred in the main dip entry almost simultaneously.

It seems unnecessary to comment on the evidence. Every experienced miner knows that in a gaseous mine, where mixed lights are used and the holes are charged with black powder, having coal dust for tamping, an explosion may happen. It might have occurred even to a jury of farmers to ask why the fan stopped at 10:30 if the explosion took place at 10:54. However, such a question would only have delayed proceedings and might have been considered impertinent. The recent inquests to investigate mine disasters discredit the law; not the intelligence of the jurors, who are apparently selected for the absence of intelligence. Incidentally it may be remarked that Henry Louttit, inspector for the district, who was at the Marianna mine when the explosion occurred, has resigned his position.

Gold Production in the Transvaal

The cabled reports from the Transvaal indicate that the December report of production was swelled even to a greater extent than usual by the inclusion of miscellaneous amounts of gold, and of reserve gold by those companies which adhere to the reserve system. The total reported for the month was 660,600 oz. fine gold, which exceeds the November output by 46,229 oz., and is much greater than that for any other month in 1908. This large report brings the total for the year up to 7,054,574 oz., or $145,818,045 in value; an amount $318,000 greater than we estimated in the annual review. This is the greatest production ever made in a single country, and is greater than the entire production of the world only 17 years ago, in 1891 and for many years previous to that. In round figures, the Transvaal produced a little over one-third of the world's total for last year.

The causes for the increase over 1907, which was $12,466,000, were fully explained in the article on the Transvaal in the JOURNAL of Jan. 9. It does not appear that the climax of production has yet been reached, but it is hardly possible that as great gains can be recorded in the coming year as the last three years have shown in South Africa.

The Conservation of Mineral Resources

The first practical fruit of the recent report of the Conservation Commission was the withdrawal from entry, by executive order, of the public lands containing phosphate rock in certain western States, and all the public lands in the petroleum and natural-gas field in northwestern Louisiana, known as the Caddo oil field. Previous to the conference of the governors last May, the public coal lands in the western States had been withdrawn. This is proper action. It is to be regretted that the scope of the Government in this direction is so limited. But, although the President, with the advice of the Conservation Commission, will probably be unable to accomplish much directly in the way of preserving our natural resources, an immense stride has been achieved through the awakening of public sentiment to the necessity for reducing the waste of resources that cannot be replaced. We venture to predict that the historian of the future will pronounce this to be one of the greatest events of the present administration.

Conditions of Gold Production

The great production of gold in the United States in the year 1908 and the reason for it, are in considerable part due to the increased proportion of operations conducted on a large scale. While the prospector and small operator still survive and their influence is not to be neglected, the production of gold is year by year coming to be the result of corporate work and the use of capital, rather than of individual effort as it was in the days of early placer mining in California and the Rocky Mountain States; and even up to the time of the first rush of discovery in Alaska. One result of this is that gold mining is yearly becoming more systematized, and that the place of the individual is becoming smaller and less important. In other words gold mining has shared in the general concentration of industry; though this process has been slower, owing to the peculiar conditions affecting the discovery and mining of the standard metal.

THE FIRST week of 1909 brings with it the obituary notices of an unusual number of prominent men. Among these are James Corrigan, one of the pioneer shippers of ore from the Lake Superior country, and a large owner of iron mines and furnace property; Joseph Wharton, the oldest and largest independent ironmaster in the East, and a man of many activities, who had made his mark in nickel and zinc as well as in iron; and Herman Justi, a close student of labor questions, an able writer on them, and a successful adjuster of many labor troubles in the western coal trade.

Views, Suggestions and Experiences of Readers

Comments on Questions Arising in Technical Practice and Debatable Points Suggested by Articles in the Journal

CORRESPONDENCE AND DISCUSSION

Mining Safety Laws

The JOURNAL published, Dec. 5, a digest of State statutes relating to safety in metalliferous mines. The names were there recited of certain States that possess such acts applicable to coal mining only. Eleven States were also enumerated as having no mining safety laws at all. They include five New England States, two Southern and four Western States, the last group consisting of California, Washington, South Dakota and Kansas, all prominent mining regions.

Suspicion was aroused that this curious deficiency might be due to the fallibility of the source of information from which the syllabus was compiled. It is not to be presumed that letters received on request from mine inspectors and similar officials will be conclusive as to the laws standing on the statute books of their States. Those laws, however, are readily and perfectly ascertainable by reference to the books themselves. In most, if not all of our States, the statutes up to a recent year have been codified or compiled and so well indeed that the entire body of mining legislation may be found in a moment. Any subsequent enactments may be ascertained with almost equal facility by a glance at the volumes of session laws.

Recourse to the statute books has proved the defectiveness of those informal statements. Setting aside the New England States, and Virginia and Louisiana, it appears that all of the four Western States named possess more or less statute law on mining safety. California has a little. South Dakota has considerable, especially relating to the office and duties of the inspector of mines. Washington and Kansas have rather copious colliery codes, together with some legislation pertinent to metalliferous mines. A resumé of the acts in force in these States is presented herewith.

COMMON LAW ALSO APPLIES

Statute law does not, however, comprise all that governs mining safety. Through the application of common law principles, by the courts, to cases of alleged negligence that are constantly arising, there has grown up a great body of definitions of the precautions that a reasonable mine owner must take, which rules have the force of law quite as much, though not quite in the same way, as if enacted by a legislature. Thus there are many cases on hoisting signals, machinery guards, tamping dynamite, etc., referring, either to mines or to other work in which the same principles are involved.

Statute law is often a mere declaration of the common law. Legislatures formally enact those rules that have already been established by court decisions. Thus, an examination of judicial opinions is important in determining what precautions for safety are recognized as necessary and proper.

It is understood, however, that the purpose of the committee's present legislative recommendations is not a mere codification of the common law, but is to be distinctly in advance thereof. That is to say, the committee proposes to lay upon mine operators duties dictated by the views of a growing enlightenment, and will not rest content with the minimum of precaution under which, on traditional principles, a mine owner can escape damages for culpable negligence.

Further, it may be suggested that the mining inspectors of the States must have established many subsidiary rules and practices which, though not standing upon the statute books have virtually the force of law.

SOUTH DAKOTA

The Political Code, revised 1903, contains a chapter on "Mines and Mining" (Chap. 24, Secs. 2532-2586). In Article 6, "Miscellaneous Provisions," is found some legislation on safety in mines. There is also a chapter on the office and duties of an inspector of mines. Subsequent to the above codification, laws have been enacted relating to ladderways and bell signals.

It would appear that, while the statutes contain some specific provisions for mining safety, yet more generally the matter is left to the inspector's discretion, in concurrence with the opinion of the courts applying common law principles. How far the inspector's recommendations are binding, and how far subject to review by the courts, need not here be discussed; but were a thorough inquiry to be made as to the legal practice of the State on mining safety it would be necessary to ask what are the actual rules and precedents of the inspector and what has been established by the reported cases of litigation.

SAFETY CAGES

"It shall be unlawful for any person to sink or work through any vertical or inclined shaft, where mining cages are used, at a greater depth than 200 ft., unless the said shaft is provided with an iron-bonneted safety cage, to be used in lowering or hoisting employees or any other persons into or from such shaft. The safety apparatus, whether consisting of eccentrics, springs or other devices, must be securely fastened to the cage and be of sufficient strength to hold the cage loaded at any depth to which the shaft may be sunk. The iron bonnet must be made of boiler-sheet iron of good quality, at least 3/16 in. in thickness, and must cover the top of the cage in such manner as to afford the greatest protection to life and limb from any débris or anything falling down the shaft" (Sec. 2581).

A fine not exceeding $1000 is provided for violation of the foregoing section. (Sec. 2582.)

EXHAUST SYSTEMS

Smelters or dry crushing reduction works are required to put in exhaust fans and dust chambers, or the like, under penalty of $500 to $1000 fine and failure to provide them shall be *prima facie* evidence of negligence. The mine inspector must visit such works at least once a month to see that this provision is complied with. (Secs. 2583-2586.)

INSPECTOR OF MINES

An inspector of mines, shall be appointed by the governor with the advice and consent of the senate. He shall be not under 30 years of age, practically acquainted with mining in all its branches and not an officer, director or employee of any mining company. He shall have access to all mines provided he does not impede their working during the examination, and the owners, etc., are to render him any necessary assistance but not to bear the expense of the examination.

Upon formal specific complaint of three or more persons setting forth that the mine in which they are employed is dangerous in any respect, he shall examine the mine. He shall serve a certified copy of the complaint, without the names of the complainants, upon the superintendent or manager, before he visits the mine, and if on examination he finds it to be dangerous he shall notify the owner, lessor, lessee or agent and "shall require all necessary changes to be made without delay for the purpose of making such mine safe for the laborers employed therein; and in case of any criminal or civil procedure at law against the party or parties so notified, on account of loss of life or bodily injury sustained by any employee subsequent to such notice, and in consequence of a neglect to obey the

inspector's requirement, a certified copy of the notice served by the inspector shall be *prima facie* evidence of the culpable negligence of the party or parties so complained of. Nothing herein shall be construed to give the control of any mine to the mine inspector or allow him to interfere with the working of any mine."

It shall be the mine inspector's duty, at least once a year, to visit every mining county in the State and examine as many of the mines therein as practicable. He shall make such recommendations as in his judgment are necessary to insure the safety of the workmen, and upon finding a mine to be unsafe shall notify the owner, etc.

In case of a serious or fatal accident in any mine the inspector shall at once be notified and shall proceed to conduct an examination in a manner more particularly set forth. The owner, etc., who shall fail to give due notice shall be fined $200 to $1000.

Children under 14 must not be employed in mines.

The inspector shall annually report to the governor all serious or fatal personal accidents, with statistical and other information tending to promote development of the mineral resources of the State.

The inspector shall receive an annual salary of $1200 with an amount limited to $1000 for expenses, besides mileage. (Secs. 136-152.)

Bell Signals

At all mines where hoisting apparatus is operated in the State of South Dakota the following code of bell signals shall hereafter be adopted and used:

"One bell, hoist; one bell, stop, (if in motion); two bells, lower men; three bells, hoist men; four bells, blasting signal. Engineer must answer by raising bucket or cage a few feet and letting it back slowly; then one bell, hoist men away from blast. Five bells, steam on; six bells, steam off. Seven bells, air on; eight bells, air off. Three-two-two bells, send down tools. Nine bells, danger signal (fire, accident or other danger). Then ring number of station where danger exists. No person shall ring any signal bell except the station tender, except in case of danger or when the main shaft is being sunk. Engineers must slow up when passing stations when men are on the cage or bucket.

STATION BELLS.

Bells.	Pause.	Bells.	No. Station.
2	"	1	1
2	"	2	2
2	"	3	3
Etc.		Etc.	Etc.
5	"	5	20

"If cage is wanted ring station signal. Station tender will respond in person. If station is full of ore and station tender is wanted ring station signal.

"One copy of this code shall be posted on the gallows frame and one before the engineer." (Laws of 1903, Chap. 181.)

Ladder Ways

"In all mining shafts 50 ft. or more in depth containing two or more compartments, ladderways shall be constructed in a compartment separate from the compartment in which the cage or bucket runs, and platforms shall be built for landings at every 12 ft., with inclined ladders between said platforms." (Laws of 1903, Chap. 179.)

California

In every quartz-mining claim where 12 men are employed daily, no shaft on incline shall be sunk deeper than 300 ft. without providing a second mode of egress, by shaft or tunnel, to connect with the main shaft at a depth of not less than 100 ft. from the surface. (Act of 1872, in General Laws of 1906, Act. 2222, Secs. 1-4.)

Act 2223 (from Laws of 1874) relates to the protection of coal miners and covers such matters as maps, outlets, ventilation, inside overseer and boilers.

Act 2224 (from Laws of 1881) provides for a State hospital and asylum for miners.

Act 2225 (from Laws of 1893) establishes a uniform system of mine bell signals. A miner disobeying this rule cannot recover.

Washington

The "General Laws," compiled 1897, contain a chapter on "Mines and Mining." (Secs. 3145-3211). Article 3, "Protection of Coal Miners" (Secs. 3158-3185—see also ammendments in Session Laws of 1907, Chap. 105) contains numerous provisions for safety. It treats of inspection, maps, number of openings, escape, ventilation, bore holes, signals, hoisting, child labor, boiler examination, explosions, timber, stretchers, tamping tools, etc.

Safety Cages

Article 4 (Secs. 3186-3193) is entitled "Protection Against Accidents from Open Shafts." It contains, however, a section requiring the use of safety cages. Every vertical shaft sunk to a greater depth than 150 ft. must be provided with a safety cage suitably bonneted with boiler sheet iron of good quality, at least 3/16 in. thick, and provided with safety apparatus of sufficient strength to hold the cage loaded at any depth to which the shaft may be sunk.

Kansas

A fairly copious mining code is provided by the statutes of the State (Gen. Stat., 1905, Chap. 66a, Secs. 4304-4373—see also session laws of 1905 and 1907). While these relate largely to coal mining, for which there are many safety provisions, it will be noticed that Secs. 4333 *et seq.*, which are concerned with that matter, apply to underground workings in general. The regulations here digested are, therefore, applicable to metalliferous mines.

Rules are laid down for the regulation of break-throughs in coal or other mines operated by the room-and-pillar system. They shall be 40 ft. apart, at least 6 ft. wide and the full hight of the vein, when that is 6 ft. or less. They shall be filled with slate rock or closed by brattice to make them air-tight as soon as the succeeding break-throughs are made. Rules are also laid down as to the manner of ventilation and of daily inspection for detection of gas.

Stairways

"It shall be the duty of the owner, lessee or operator of any mine where the natural strata are not safe in or around all workings, pumping and escaping shafts, to securely case-line or otherwise make said places secure, and all escapement shafts shall be provided with stairways securely fastened so as to bear the combined weight of not less than 15 men ascending or descending the same. Said stairways shall be so constructed as not to exceed 45 deg. of elevation by each section of said stair, and each section shall have substantial guard rails securely fastened, and the stairways shall be separately partitioned from the parts of such shafts used as upcasts or downcasts, and the traveling ways between the bottom of the main shaft and the escaping shaft or stairways shall be at least 5 ft. in hight. Said traveling ways shall be kept clear of all obstructions, and standing or stagnant water shall not be allowed to accumulate in any traveling way between the upcast and downcast shafts. And in case of mine shafts which are over 150 ft. in depth, where stairways cannot be conveniently constructed, other safe means of hoisting the persons employed in such mine must be kept ready at all times, so as to be available in case of accident to the regular hoisting shaft or machinery in use at the same time." (Sec. 4337.)

Manner of Ascending

"It shall be the duty of the foreman, cager or whosoever may have charge of the bottom of any shaft, to give the proper signal to the topman and engineer whenever any six employees who work therein are ready to ascend, by day or night, and for the making of such ascent it shall be the duty of the bottom cager to give them an empty cage by which they can ascend. And every road on which persons travel underground, when the coal is drawn by mules, or other power, shall be provided at intervals of not more than 30 ft. with sufficient manholes for places of refuge." (Sec. 4338.)

Airways

"Airways of sufficient dimensions shall be provided. In no case shall the area of the air course be less than 21 ft. in mines operated on room-and-pillar system. Stag-

nant water shall not be allowed to remain in air courses, entries, traveling ways or rooms. Airways must be kept clear of obstructions. They must be examined twice a week and reported on once a month to the State mine inspector. Air gates shall be kept open no longer than necessary." (Secs. 4339-4343.)

To inforce the foregoing regulations the powers of the inspector, method of procedure and penalties are defined. The law is to be kept posted at or near the top of the mines. (Secs. 4346-4349.)

EDWARD P. BUFFET.

New York, Dec. 16, 1908.

The Elmore Process at Cobar

In G. W. Williams' article entitled "Cobar Gold and Copper Field, New South Wales," in the JOURNAL of Nov. 14, 1908, he says: "The Cobar gold mines erected three Elmore units but they have thus far not proved a success." This statement conveys a wrong impression, as the three units erected by the Cobar Gold Company have accomplished all that was expected of them, and indeed more.

The facts in the matter are very simple. The Cobar Gold Company has an ore which is exceedingly difficult to treat. A number of different processes were tried, and, among others, our own. The company appointed Johnson & Sons, of London to investigate the method. A bulk parcel of average ore was obtained and put through our testing plant under Johnson & Sons' immediate supervision. The result of these trials was that the Elmore plant was recommended.

The results obtained in the trials showed the crude ore to contain about 1.25 per cent. copper and about 0.55 oz. gold per ton. From this material an extraction was secured of about 90 per cent. of the copper and about 52 per cent. of the gold, leaving in the tailings from the Elmore plant about 0.15 per cent. copper and about 0.30 oz. gold. Johnson & Sons recommended the cyaniding of these tailings for the recovery of the remaining gold, so that really the Elmore process was intended to be applied in this case for the removal of the copper, the presence of which excluded the possibility of satisfactory direct cyanide work.

The plant in due course was erected, but the old battery which existed on the mine was in a state of great dilapidation, and this expression also fairly describes the power plant. Under such conditions of power and crushing plant, it was naturally impossible to secure continuous running, and as it turned out the battery produced an enormous proportion of slime material. Notwithstanding these obvious drawbacks the Elmore plant actually accomplished the same results on the mine as were secured in our testing plant in London.

We have, therefore, nothing to apologize for in connection with this installation, but the fact is that, owing to the presence of the very large amount of extraordinarily fine slimes produced from this particular ore by the battery, the Cobar company found it practically impossible to cyanide the tailings from the Elmore plant; and here the whole crux of the question lies at the present moment.

The consulting engineer of the Cobar Gold Company is about to leave for the mine to investigate this matter of the crushing and power plant, and it is hoped that the plant will soon start again with modern power plant and crushing appliances.

J. STOCKER.

London, England, Dec. 9, 1908.

Alunitization

I have read with much interest the two recent articles in the JOURNAL of Dec. 5 and 12, 1908, by Robert T. Hill, relating to gold deposits of the alunitic type, and your editorial comment on the significance of the association of alunite and gold. While I am gratified, of course, at the importance attached to the investigations at Goldfield, I feel that a word of caution is necessary. My remarks are not in criticism of Mr. Hill's interesting contributions, but are intended for readers who, it may be supposed, are less trained than he in careful discrimination and deduction.

It is entirely true that the Goldfield type of deposit is new and of unusual interest. It is further true that the presence of alunite is suggestive of chemical activity of a kind that may produce valuable deposits, and that it thus invites attention from prospectors. It should be borne in mind, however, that many of the occurrences of the mineral listed in my original paper* have no connection whatever with gold. Alunite, in short, may form wherever natural solutions of sulphuric acid, especially thermal or strong solutions, react on rocks containing potassium feldspars or sericite. The sulphuric acid may conceivably be derived from various sources. It may be directly volcanic; it may be produced by the oxidation of solfataric hydrogen sulphide; or it may come from the oxidation of pyrite.

The alunite at Cripple Creek, referred to in your editorial, occurs in small quantity and has unquestionably been formed in the oxidized zone by sulphuric acid derived from pyrite and acting probably on sericite. It is accordingly secondary and has no genetic significance as regards the unoxidized ores. The alunite at Goldfield, on the other hand, is very abundant, and its formation is certainly connected with the genesis of the rich ores. The precise nature of that connection is still under investigation and will, I hope, be explained in a full report on the Goldfield district now nearing completion.

The scientific worker is occasionally surprised by the readiness with which others attach practical importance to and draw sweeping conclusions from what to him is an interesting and suggestive, but not necessarily a revolutionary, discovery. This rapid application of new light to practical ends is, of course, most likely to outrun discretion where the illumination can supposedly be at once directed to so attractive an object as a rich gold deposit.

F. L. RANSOME.

Washington, D. C., Dec. 20, 1908.

*"The Association of Alunite with Gold in the Goldfield District, Nevada." Economic Geology, Vol. 2, 1907, p. 667.

The Origin of Coal

To the reasons urged by Hiram W. Hixon, in the JOURNAL of Aug. 1, 1908, in favor of a deep sea origin for coal, may not the usual presence of a bed of fire clay, immediately under the coal, be added?

It is difficult to imagine an abundant vegetation having its roots in such a clay and deriving any sustenance from it, while the origin of the fire clay, as a deep sea deposit is much more probable.

EDGAR HALL.

Silverspur, Queensland, Oct. 23, 1908.

Acetylene Lamps Underground

Acetylene lamps, according to W. F. Slaughter (*Proc.*, Lake Superior Min. Inst., Vol. XIII, p. 206), consume about one-fifth as much oxygen as candles do when giving the same amount of light. On that account, when it is necessary to work in badly ventilated stopes or headings, acetylene lamps should be used, not only because they consume less oxygen, but also because they give a bright light in air in which it is difficult to make a candle burn. Acetylene lamps are now made small enough to be worn on a miner's hat; they are used at the Saginaw mine on the Menominee range, Michigan. While the lamps require some attention in order to keep the water feeding properly to the carbide, the miners soon learn how to care for them. The lamps then give little trouble. It is said that it costs about two-thirds as much for light when acetylene lamps are used as against candles. At the Michigan mine the cost of the carbide required to last a 10-hour shift is about 2 cents.

The frequent use of water for spraying in the carbonate workings and the compulsory use of water jets for machine drilling, according to the report for 1907 of the Department of Mines, New South Wales, page 89, has had a very beneficial effect in diminishing lead poisoning at the Broken Hill mines.

Personals

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

C. W. Purington, who has been visiting New York and Boston, sailed Jan. 9 for London.

Edward K. Judd, of New York, mining engineer, is in Sonora, Mexico, on professional business.

Edward H. Cook, mining engineer, has removed his office from Tucson, Arizona, to El Paso, Texas.

Charles Sweeney has resigned his position as president of the Federal Mining and Smelting Company.

G. W. Wertz, recently in the Cœur d'Alene district, Idaho, has taken charge of the Southern Gold mine at Gold Hill, North Carolina.

Harry D. Quinby, of Denver, Colo., has arrived at Gold Hill, N. C., to install the Elmore oil vacuum concentrating process at the Union Copper mines.

Dr. William B. Phillips, of Birmingham, Ala., has just spent a month examining the brown-ore lands in western Kentucky owned by the Hillman Land and Iron Company, of St. Louis.

Herbert C. Hoover, of London, was in New York last week. He went to San Francisco Jan. 8, and expects to return about Feb. 1. He is to give some lectures on mine finance to the students of of Columbia University.

S. S. Rosentamm, representative of Adolph Lewisohn, of New York, who recently acquired control of the Kerr Lake mine, Cobalt, visited the property recently, accompanied by Benjamin B. Lawrence, consulting engineer.

Henry P. Louttit has resigned his position as mine inspector of the First Bituminous district of Pennsylvania. It was in this district that the Marianna mine explosion occurred recently. His successor is William H. Howarth, of Mount Pleasant.

Reginald Meeks, metallurgical engineer, who has been connected with the staff of the ENGINEERING AND MINING JOURNAL, has resigned and will be associated with Dr. Charles T. Hennig, managing the latter's testing and research plant in East 35th street, Brooklyn.

William B. Dickson, heretofore second vice-president, has been chosen first vice-president of the United States Steel Corporation, in place of James Gayley, resigned. His successor as second vice-president is David G. Kerr, heretofore manager of the iron-ore interests of the Carnegie Steel Company.

W. A. Carlyle has been appointed professor of metallurgy at the Imperial College of Science and Technology, London, to succeed Professor Gowland. He is a graduate of McGill University, Montreal, 1887, and was a professor there 1891 to 1895. He has had practical experience in Colorado, in British Columbia and as manager of the Rio Tinto mines in Spain, and was Provincial mineralogist of British Columbia for three years.

James M. Swank has tendered his resignation as secretary and general manager of the American Iron and Steel Association, to take effect on the election of his successor. Mr. Swank was largely instrumental in the organization of the association; has been its secretary for 36 years and general manager also for 22 years. His retirement will be regretted by the many who appreciate the value of his hard and constant labors for the association and the care and fidelity with which he has collected and arranged the statistics of the trade.

Obituary

Frank Taylor died at Watford, England, Dec. 25, aged 59 years. He was connected all his active life with the well known firm of John Taylor & Sons, of London. For 18 years he had special supervision of the Australian interests of the firm.

Walter Richardson Crosby died in Berkeley, Cal., Jan. 2, aged 49 years. He was for a number of years connected with the Venable Construction Company, Atlanta, Ga., in the execution of important engineering works. Five years ago he went West, taking charge of the Butters Reduction Works at Virginia City, Nev. Two years ago he was made general manager of the Butters mining and metallurgical interests, with office at San Francisco.

Herman Justi, one of the best known men in the Western coal trade, died at Chicago Jan. 1, aged 56 years. He was born in Kentucky and lived in that State and Tennessee for 46 years, having been engaged in business on a considerable scale. As a chief of publicity of the Tennessee Centennial Exposition in 1897 he found temporary field for the exercise of his undoubted talents. Coming to Illinois the year following at the instance of his friend, the late W. P. Halliday, of Cairo, then a leading coal producer of southern Illinois, Mr. Justi helped found and for 10 years successfully and ably administered the affairs of the Coal Operators' Association. The problem of labor and capital deeply interested his mind and he wrote several valuable monographs on labor questions. As commissioner of the Illinois association he helped to settle many disputes, and secured many concessions from the miners, who had much confidence in his fairness and honesty.

James Corrigan, head of the firm of Corrigan, McKinney & Co., died at Cleveland, Ohio, Dec. 24, aged 60 years. He was born in Morrisburg, Ont., and as a boy went to Cleveland and found employment on a lake schooner. Later he engaged in the oil business, but afterward sold out to the Standard and entered the shipping trade, acquiring a considerable fleet of vessels. James Corrigan was one of the earliest to recognize the possibilities of the Lake Superior iron country, and it was a natural step from the carrying of ore to the mining and smelting of it He became a consistent buyer of Lake Superior ore properties, and at the time of his death was the most extensive independent operator on the ranges. On the Mesabi range the firm owned the Admiral, Commodore, Jordan, St. James, St. Paul, Stevenson and Wallace mines; on the Gogebic, the Colby, Colby No. 2, Ironton, and Ironton No. 2; on the Menominee the Armenia, Baker, Basic, Crystal Falls, Dunn, Fairbanks, Genesee, Great Western, Groveland, Kimball, Lamont, Lincoln, Paint River, Quinnesec and Tobin; on the Marquette the Star West mine. The firm also from time to time acquired interests in blast furnaces. Their holdings included the Genesee Furnace Company, at Charlotte, N. Y., the Scottdale Furnace Company, at Scottdale, Penn., and the Josephine Furnace and Coke Company, at Josephine, Penn. At Josephine, the firm founded a town as well as a furnace. He had also planned to build a new furnace on the Cuyahoga river at Cleveland, under the name of the River Furnace and Dock Company. This is expected to be in operation in 1910. In recent years the firm gradually withdrew from the ownership of vessels, devoting attention more especially to the operation of mines. Mr. Corrigan also in recent years acquired large interests in copper mines in Mexico.

Societies and Technical Schools

Mining and Metallurgical Society—The annual meeting was held Jan. 12, at Columbia University, New York.

American Institute of Mining Engineers—The 96th meeting of the Institute for the reading and discussion of papers will be held at New Haven, Conn., beginning Feb. 23. Professor J. D. Irving, Yale station, New Haven, Conn., is secretary of the local committee of arrangements. A complete list of the papers to be presented at this meeting cannot be given; but it may be said that, among the leading topics of discussion, according to present expectation, will be: Professional Education (in connection with the inspection of the new Hammond laboratories, etc., of the Sheffield Scientific School); the Conservation of National Resources; and the Construction of a Sea-Level Panama Canal (in connection with a paper by Henry G. Granger, to be published in the January *Bulletin*). Various entertainments and visits to works in and near New Haven have been planned.

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives at San Francisco, Butte, Goldfield, Nev., Denver and Toronto

REVIEWS OF IMPORTANT EVENTS

San Francisco

Jan. 8—A short time since mention was made in one of these letters of a merger of gold-dredging companies under the name of the Natomas Consolidated, taking in all the dredging interests near Folsom and some at Oroville. The capital stock of the corporation is $25,000,000 and bonds to a large amount are issued, the cost of purchasing the dredge interests in question being some $7,000,000. It was thought at the time that more or less of the capital required would have to come from Eastern sources, but at a meeting held in this city last week it was found that enough had been subscribed here. Eastern men who wished to become interested were unable to come in, as the California subscriptions were sufficient.

Action has been commenced in the United States Circuit Court in this city against the Trinity Bonanza King Mining Company for $2174, the value of certain Government timber alleged to have been cut for use in the mine for lagging and timbers. The timber was sugar pine and red fir. The miners have to be careful in these days where the timber supply comes from, even when they buy it from people supposed to own the land where it grew.

The Northern Electric Railway Company is endeavoring to have the city officials of Oroville modify in some manner the injunction against the Indiana Gold Dredging Company, to avoid prospective trouble with that company. The right of way of the Northern Electric Company runs over the dredging company's land and when the right was secured the railway people agreed to let the dredge cut through their track line; but this was to be cut only once. Since the city's injunction against the dredging company that company has changed its plan of dredging, and this involves three cuts instead of one, thus involving great expense on the part of the railway company.

Work is about being started by the Metropolis Construction Company on the contract to build the impounding reservoirs or settling basins planned by the Government engineers as part of the scheme to relieve the waters of the Yuba river of débris near the town of Hammonton where the gold dredgers are operating. Each settling basin will have an area of 1000 acres. In addition to the exact uses to which the basins are to be put, some advantage will be derived by the dredge operators at that point, above Marysville.

Quite heavy rains this week have succeeded the freezing days of last week in the mining regions of the State. There is still, however, some trouble with snow in the ditches and in the higher ranges there is much ice to contend with.

The Seal of Gold Mining Company in Virginia Dale district in the southern part of the State recently leased its group of mines to H. R. Slater. One of the directors subsequently instituted suit in the name of the company to have the lease canceled. The judge of the district court has now settled the matter by deciding that Slater has a right to his lease. W. L. Peters, of Riverside, is president of the company.

Goldfield, Nevada

Jan. 5—The State bullion-tax collector estimates the gold production of Nevada for 1908 at $14,000,000, this amount being calculated from the actual production of $10,019,730 for the nine months ending Sept. 30.

Dividends paid by Goldfield properties for the past year amount to $1,578,500 made up as follows: Florence Goldfield, $420,000; Engineer's lease, $570,000; Rogers Syndicate, $300,000; Mohawk Jumbo, $78,000; Frances Mohawk $45,500; Florence Annex, $50,000; Red Top Consolidated, $20,000; Little Florence, $30,000; Mohawk Combination, $65,000. Considering the inactivity of the two largest properties—the Consolidated and the Florence—pending the construction of their mills, this is a very creditable showing.

The Goldfield Traction Company last week commenced work in Columbia for the trolley system; grading will be carried on from that point into Goldfield where the road will traverse the principal business and residence streets while another loop will cover the mining territory to the east of town. The management expects to have six miles in operation by July 1, 1909.

Charles S. Thomas, ex-Governor of Colorado, and W. H. Malburn are reported to have withdrawn from the firm of Thomas, Bryant and Malburn. This firm has been legal adviser to the Goldfield Consolidated Company since it was formed. H. S. Bryant, together with J. P. O'Brien, former district judge of Nye county, under the firm name of Bryant & O'Brien, will continue as legal advisers for the Consolidated.

The Fish Lake valley oil excitement continues, and that vicinity is the scene of much activity; thousands of acres have been located, one syndicate alone holding over 50,000 acres. Oil shows at surface in a number of places; this oil is claimed to have a paraffin base. Fish Lake valley is about 75 miles west of Goldfield near the line between Nevada and California.

Butte

Jan. 7—The report of the State coal mine inspector for 1908 has been made public. The report calls attention to what the inspector calls the criminal disregard for the welfare of the coal miner, and advocates a more thorough regulation by law of the safeguards necessary for the miner's protection. The production of coal for the year ending Nov. 1, 1908, was 1,979,217 short tons, a decrease of 2.5 per cent. The fatalities for the year were 12 and the number of injured was 51.

The annual report of the Butte Mining Stock Exchange for 1908 shows an increase in the number of shares traded in during that period as compared with the previous year, although the values represented were less. There were sold on the exchange 1,593,345 shares of stock, valued at $455,740, during 1908, as compared to 1,520,183 shares, valued at $560,007, in 1907.

A reorganization has taken place in the lines controlled by the Chicago, Milwaukee & St. Paul Railway. The original corporation, which is organized under the laws of the State of Wisconsin, retains the same name, but the subsidiary companies, formerly known as the Chicago, Milwaukee & St. Paul railways of Washington, Idaho, Montana and South Dakota respectively will cease to have independent organizations and the entire line from Mobridge, on the Missouri river to Seattle will be controlled by the newly organized Chicago, Milwaukee & Puget Sound Railway, a Washington corporation. The entire stock of this company, capitalized at $100,000,000, will be held by the Wisconsin corporation.

Denver

Jan. 9—In the Cripple Creek district, the Portland Gold Mining Company advertises that it will now buy all grades of Cripple Creek ores, paying cash, and giving lowest treatment rates, though the rates are not quoted.

At Stratton's Independence, an initial run is to be made of 50 tons daily of low-grade ore in the dry mill. The concentration plant is to be run 30 days later.

A suit has been filed again Stratton's

Independence, Ltd., in the United States Circuit Court in Denver, by the Portland Gold Mining Company to recover $366,000, alleged to be the value of ore illegally extracted from the latter's territory. This is an old suit revived.

The suit against the county commissioners of Teller county for a readjustment of assessment on their properties by 40 mining companies as plaintiffs, has been commenced.

A report on the estate of the late W. S. Stratton, discoverer of the Independence mine, shows a value of $6,418,190, as against $6,307,166 at the time of his death. It is stated that the estate will be wound up at once, and the building of the Myron Stratton Home commenced.

One of the toughest mining fights ever waged has just been won by Allen L. Burris, a young man under 30 years of age, who, after a 12 years' struggle, has wrested the control of the El Paso Consolidated company from the Bernard faction. The property consists of about 65 acres on Beacon hill, in the Cripple Creek district, and has paid upward of a million and a quarter of dollars in dividends. The victor was backed by Eastern capital, and from being trammer underground, has risen to be president and general manager of the company.

The Moose Gold Mining Company is reported to have sold the Trilby and Ben Harrison claims to the Trilby Gold Mining Company, and to have thereupon declared a dividend of $85,000. The Moose was one of the early bonanzas of the Cripple Creek district, but has been idle for many years on account of the deadly gases encountered in the lower workings.

Toronto

Jan. 8—The wagon road to Gowganda is being rapidly pushed forward by the Canadian Northern Railway from Sellwood, the end of the railroad being built north from Sudbury, to the new camp—about 42 miles. The railway announces that its traffic department will receive freight for Gowganda from any Canadian point. This will be forwarded by rail *via* Sudbury to Sellwood, and there sent on by the company's teams to Gowganda.

The total output of ore forwarded to the smelters from Cobalt during 1908 is given as 25,463 tons, as compared with 14,851 tons for 1907. The increased value, however, is considerably greater than these figures would indicate, and a considerable proportion of the shipments last year were concentrates, and less lower-grade ore was sent. The total number of shipping mines was 32, the principal shippers being La Rose 4715 tons, Nipissing 3557; O'Brien, 3428, and McKinley-Darragh 1871 tons.

An expedition is being fitted out at Elk City under direction of Thomas Saville, a well-known guide and prospector, to look for a new silver field west of Gowganda. Mr. Saville claims to have obtained certain information as to its existence from the Indians of the region with whom he was associated for many years.

The Ontario government has issued an Order-in-Council withdrawing from prospecting a large area in the Gowganda district. This includes all the lands not already staked in the townships of Haultain and Nicol and two other as yet unnamed townships 50 miles northwest of Cobalt and 20 miles from James township; the area affected contains about 140 square miles. The bottoms of all lakes in the district and a strip of land 66 ft. wide around all lakes are also withdrawn. Among some of the lakes affected are Gowganda, Abusking, Wigwam, Everett, Bloom, Miller and Leroy. The order exempts all claims staked out before December 18. About two-thirds of the townships specified have already been taken up and Miller and Leroy lakes have also been largely staked. It is probable that the areas withdrawn will be offered for sale subject to royalties.

In several of the cases against mining companies for violation of the law regarding prospectuses an arrangement has been arrived at, under which a statement of facts will be submitted to the magistrate, and should he decide to convict, a stated case will be submitted for the decision of a higher court.

Johannesburg

Dec. 20—When the introduction of very heavy stamps was first attempted by the Consolidated Gold Fields, considerable opposition was raised to the principle, both by practical mill men and consulting engineers. Gradually, however, their special applicability has been clearly revealed and different interests appear to be rivalling each other in their efforts to install the weightiest stamps on the field. A mine in the Krugersdorp district—the West Rand Consolidated—is now about to install an additional 20 stamps weighing 1850 lb. each, for an estimated duty of 12 tons per stamp per day. This will constitute a record for gravity stamp work. It may be pointed out that the duty factor is dependent upon size of screening, and that comparisons of duty provide no test of efficiency, for regrinding has to be undertaken in tube mills as auxiliaries. In all cases, however, a limitation to very coarse crushing in the stamp battery is apparent, owing to the invariable use of amalgamating tables between the stamps and the tube mills. The heaviest stamps now actually in operation on the Rand are those of the Simmer Deep—1670 lb.—which have been working satisfactorily for two or three months. The East Rand Proprietary mines are now also adopting this standard of stamp weight.

Three or four years ago there raged a fierce controversy among certain medical men and chemists as to the cause of the sicknesses associated with underground life on the Rand, and those who maintained that gases and bad ventilation were inadequately appreciated factors and that dust was too constantly defined as the basis of all ills, are apparently ahead. Additional support has been provided by Mr. Cullen, who—as manager of the Modderfontein dynamite factory—spoke with familiar authority on "The Gases Resulting from the Use of High Explosives," and did not hesitate to emphasize the points of blemish in connection with blasting practice on the Rand. A result of Mr. Cullen's investigations on the field has been to indicate that there is a greater evolution of carbon monoxide by the detonation of blasting gelatin—the staple "powder" of the Rand—than is generally supposed. The points of importance are that the anti-fume mixtures or neutralizers are valueless; that clay tamping gives better results than sand cartridges; that fresh gelatin gives no better results than that three months old; that within this age limit, No. 6 detonators are as serviceable as No. 8; that blasting gelatin is improved by extra oxygen in its composition; that ordinary time fuse vitiates the mine atmosphere to a great extent; and that electrical firing not adopted in Rand working practice, gives better results than time fuse.

A promising addition to the constitution and rules of the Chemical, Metallurgical and Mining Society has been proposed which carries still further the idea of expansion. The scheme is for the formation of local sections in any district, in South Africa or not, where at least 20 members or associates reside and are anxious to hold meetings for the discussion of questions. The special advantages to outside members will be the use of the Society's *Journal* for the publication of proceedings, while they will also, of course, benefit by the influence and reputation of the parent body. The chairman of the local committee shall be vice-president of the general society and the local secretary a corresponding member of council. Reports of proceedings and papers contributed at section meetings will be edited and the expense of publication borne by the general funds, from which a grant may even be made, if the work undertaken is of interest, toward the expenses of maintaining the local sections. The society has already corresponding members of council in England, Colorado, Mexico, Sumatra and Queensland.

The Transvaal University College decided to establish a travelling scholarship for the student who comes first in the four-years' mining course. A sum will be provided to enable the successful graduate to visit any other mining field in Europe or America, to gain special influence in any approved line of study.

Mining News from All Parts of the World

New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents

THE CURRENT HISTORY OF MINING

Arizona

GILA COUNTY

Miami—Plans are being made for a 2000-ton concentrator and a short line of railroad will probably be built this winter. A 120-ft. crosscut on the 570-ft. level is reported to be in 3 per cent. ore. A crosscut on the 800-ft. level is also in ore.

GRAHAM COUNTY

Detroit Copper—This company has installed new boilers and crude-oil burners in the heating plant at the concentrator. The old tunnel which connects the mines and concentrator with the smelter has been widened to accommodate 36-in. gage cars. This saves much transferring of coal and heavy machinery to the small cars formerly in use.

Arizona Copper—Concentrator No. 6 at Morenci has been enlarged. A large amount of money is being expended for the improvement of the trails for the benefit of the workmen.

Chase Creek—This company plans to extend the 2000-ft. tunnel another 1000 feet.

PIMA COUNTY

Imperial Copper Company—The report for the six months ending Sept. 30, 1908, shows that the company produced 4,109,078 lb. of copper and 62,728 oz. of silver. The company has blown in the second unit of its smelter and in December, 1908, turned out 800,000 lb.; January's output should be 1,000,000 lb. Conditions at the mine and smelter have been bettered during the past year, more ground has been opened, a large tonnage mined, capacity of the smelter doubled, and everything put in readiness for increased operations. An additional unit has been installed at the smelter, bringing the capacity of the plant to about 700 tons. In payment for the additional unit the company has received $100,000 additional capital stock of the smelting company, making a total of $900,000 held by the Imperial. The balance sheet as of Sept. 30 shows an item of $2,000,000 bonds and bills payable of $602,305, held entirely by the majority stockholder, the Development Company of America. Accounts payable amount to $148,960.

SANTA CRUZ COUNTY

Red Hill—At a point 285 ft. in the tunnel on the opposite side of the hill a body of chalcopyrite has been opened. The main tunnel cut into an ore body 420 ft. from the portal, thus indicating an ore zone 600 ft. wide. Drifts are being run east and west from this main tunnel.

Pittsburg Mine—The shaft is down about 200 ft. At 160 ft. a crosscut went through 8 ft. of low-grade ore. Ore is reported in the bottom of the shaft.

YUMA COUNTY

Clara Consolidated—Two new strikes are reported on the Morro group, carrying about 7 per cent. copper and considerable gold. Work is progressing on two inclined shafts.

California

ALAMEDA COUNTY

Phoenix Quicksilver Mine—This mine, not far from Livermore, after three years idleness is to be started up again by a new company composed of M. J. Laymance, S. A. Knapp and other Oakland men. The works are being cleaned up and the retorts repaired. The mine has never made any product, but at the time of the death of Alvinza Hayward, its principal owner, was about to become productive.

AMADOR COUNTY

Argonaut Mining Company—A new station is being cut on the 3000 level of this mine at Jackson. The Hoffman field ground is expected to yield largely in the future.

CALAVERAS COUNTY

Four Hundred—This mine near Mountain Ranch is being opened by Oakland men under superintendency of A. Mauna. The rock is expected to mill from $6 to $10 per ton. A steam hoist will shortly be installed.

EL DORADO COUNTY

Snow—This property near Newtown, which has been tied up in an estate for some years has been bonded by B. G. Haskell, C. A. Pugh and others of San Jose. There is a large gravel channel underlying this ground and it is now to be worked.

HUMBOLDT COUNTY

Gem—At this placer mine, 10 miles from China Flat, B. G. Steele and others are preparing to operate a No. 3 giant. A new device of Mr. Steele's to save the gold and platinum is being installed.

INYO COUNTY

Four Metals Company—The smelter of this company at Keeler is handling something over 150 tons daily of slag from the old furnaces. When the aërial tramway is finished, Cerro Gordo ore will be smelted.

MARIPOSA COUNTY

Mariposa Commercial and Mining Company—This company now has three mills crushing rock, most of the ore coming from leases on the company's mines.

MONO COUNTY

Wild Rose—H. G. Lowers and others are starting up this old mine eight miles west of Benton.

NEVADA COUNTY

Golden Gate—At this mine, Grass Valley, a new 10-stamp mill, centrifugal pump, and other improvements have been added to the equipment. The mine is an old one and was reopened a year ago by C. C. Haub, but has been taken off the lessees hands by the present company. Electric power is to be used. W. H. Martin is the superintendent.

PLACER COUNTY

Harlow—Laird and the Quinn Brothers have nearly completed the mill at this mine and will shortly commence crushing cement gravel. The mine is near Rocklin.

Orpheum—This company in Ophir district is putting the gallows frame over the new two-compartment shaft and will soon install an electric power plant.

PLUMAS COUNTY

Long Valley Mines Company—At this property, purchased this season by Capt. Adams and associates, the ore taken out is about to be milled. It is probable that work will continue all winter.

SAN BERNARDINO COUNTY

Anaconda—In this mine, near Twenty-Nine Palms, owned by the Mohawk Herald Company, high-grade ore has been struck in the shaft. This is in Gold Palms camp, five miles from the quartz mill at Twenty-Nine Palms.

SHASTA COUNTY

El Dorado—At this mine, near the Tower House, owned by E. P. Connor & Son, and under lease to Sherk Brothers, of Redding, a small mill is being erected.

SIERRA COUNTY

Gray Eagle—A new aërial tramway is being built from this mine to the mill.

Brush Creek and Ante-Up—These two claims near the Mountain House have been bonded to L. L. Battey, of St. Louis, and L. A. Armstrong has been appointed superintendent. These are old mines once profitable, but long idle.

SISKIYOU COUNTY

Grouse Creek—This company is putting in a large flume and will start up as soon as there is sufficient water.

Gardner & Weed—This big hydraulic claim in Quartz Valley has been completely fitted up and a large amount of gravel can now be handled.

TEHAMA COUNTY

Tom Head Copper—A large ledge has been found in the lower or 300-ft. tunnel. Considerable underground work is being done this winter, but no machinery is running.

TRINITY COUNTY

Gem—At this gravel mine, 10 miles above Willow creek, in the old channel of the main Trinity river, the operators have installed a new plan of handling the rock and other débris by means of machinery driven by a Pelton wheel.

TUOLUMNE COUNTY

Central Mother Lode Mining Company—This company has been incorporated with E. C. Kavanaugh as general manager. A force of men has been set at work on the Mangante claim.

Kanaka—This quartz mine, with its mill, has been sold by C. M. Lindsay to Agnes D. Parr, of London, England. A water right is also included in the sale.

Kinkard—Cadamartori, Lambert & Ryland have leased this mine on the Ryland ranch three miles from Sonora.

Santa Ysabel—Good ore has been encountered in this mine, near Stent, and the 10-stamp mill is again running. Ten more stamps are to be added.

Tarantula—C. F. Crawford and associates, owning this mine near Chinese, have ordered a compressor and machine drills and will continue the main tunnel. Rich rock has recently been struck.

Colorado

CLEAR CREEK COUNTY

Banner Consolidated—This company, operating near Idaho Springs, is planning the erection of a 500-ton concentrating mill; also development along heavier lines.

GILPIN COUNTY

A. K. R. Gold Mining Company—Gold retorts weighing nearly 300 oz. were sold to the Denver mint during December, the gold bringing the unusual price of $19.86 per oz., believed to be the highest grade amalgam gold purchased by the Mint from any mine in Colorado. The concentrates also are exceptionally rich, the last carload shipment selling to the Argo smelters for $90 per ton. New machinery, consisting of air compressor, boiler and engine, is being installed and an additional battery of five rapid-drop stamps is to be added to the mill. George M. Ashmore, Rollinsville, Colo., is manager.

Oh Be Joyful—Denver people have become interested in a lease and bond and are erecting a new shaft building and installing machinery. C. H. Chase, Miners' Exchange building, Denver, Colo., is manager.

LAKE COUNTY—LEADVILLE

Garbutt—From the lower levels this mine, Breece hill, is shipping 30 tons daily of a good grade of iron sulphides and copper sulphides; the ore carries gold in addition to copper.

Helena—In this mine, Iowa gulch, a station is being cut at the 700-ft. level, where a large pump will be installed. When the station is cut sinking will be resumed; the depth of the shaft is now 720 ft., with 80 ft. still to go. In sinking several streaks of ore have been encountered, which will be developed later. As the shaft gains in depth the formation changes.

Majestic—This shaft, Mosquito range, is now down 100 ft. and a contract has been let to sink another 100 ft. The vein has been caught, and when the shaft reaches a depth of 200 ft., the owners expect to have shipping ore. The property adjoins the London, and the shaft is being sunk on that fault.

Progressive—In this mine, on North Fryer hill, the work which has been carried on in the lower levels for the past two months has developed a body of ore that bids fair to becoming a permanent shoot. In the north drift the ore has been opened and is now over the whole face of the drift, running well in silver and 60 per cent. lead. The orebody is being developed as quickly as possible.

Granite Tunnel—This enterprise is being driven from Granite in the direction of Leadville and is in several hundred feet; several veins have been cut, but none mineral bearing. During the week a vein, several inches wide, was encountered running high in gold. The enterprise is financed principally by local men.

Progressive—In this mine, North Fryer hill, with the new plant of machinery recently installed the lessees have been enabled to unwater the shaft, and are now handling the flow of water with ease. Drifts are being driven into new territory and from present indications the lessees are likely to catch the orebodies that trend through this section of the district.

Gallagher—A good body of ore has been opened in the old workings, Graham park, and as it carries considerable lead it is welcomed at the local smelter; the silver is also high. From this body 20 tons a day are shipped. Now that the old shaft has been cleaned out and retimbered, it is the intention of the leasing company to sink a new shaft to the north.

Half Moon Group—A company of local men have organized a company to operate this group of claims, Robinson, and work will be started within a few days. The group adjoins the famous Robinson mine.

Progressive Shaft—The body of ore recently opened in this shaft, North Fryer hill, is looking so well that the lessees have decided to sink the shaft deeper and open the orebody at greater depth. Ore shipments are being made to the local smelter.

Yak Tunnel—December was the banner month of the year as far as breaking ground in this adit was concerned; 358 ft. were driven in 30 days. The tunnel is now into Resurrection No. 1 shaft, and in a few days it is expected that several large bodies of water will be tapped. During the run from Ibex No. 4 shaft to its present breast the tunnel has cut four veins in the granite, all carrying gold.

TELLER COUNTY—CRIPPLE CREEK

Gold Sovereign—At the annual meeting last week the present management was successful, voting 926,000 shares, against 528,000 for the opposition, or Rapp party. The directors chosen were J. N. Auer, O. H. Hines, Le Mars, Ia.; M. F. Wendling, Quincy, Ill.; Henry Sachs, Colorado Springs, Colo.; E. J. Boughton, C. G. Jackson, H. L. Shepherd, Cripple Creek, Colo. Resolutions were passed approving the policy of the directors of the last year and deprecating and disapproving the action of the previous board in the granting of a lease on the properties to the Franklin Leasing Company. The board elected O. H. Hines president; M. F. Wendling, vice-president; H. L. Shepherd, treasurer; C. G. Jackson, secretary.

Mary McKinney—The Western Investment Company, leasing this mine on Raven hill, has found a promising vein, said to be of large size, in a crosscut run west from the shaft at the 500-ft. level. The vein is vertical.

Agnes—Work has been begun on this company's Four Brothers claim on Beacon hill. Machinery has been installed in the shaft-house and other preparations made. Eastern parties will operate the claim under lease.

Gold Dollar Consolidated—The Union Leasing Company, operating the Husted shaft of this company on Beacon hill, is shipping steadily ore taken from the large orebody between the 300-ft. and 400-ft. levels.

Londonderry and Manhattan—The claims owned by these companies on Bull, Gold and Ironclad hills have been placed

in charge of J. W. Parfat as resident manager. He will examine and report on these claims, and it is understood that he will have authority to lease blocks of the ground when the examination is completed.

Pike's Peak—In this mine, owned by the Stratton estate, two sets of lessees, Myers & Co. and Schoolcraft & Co., are operating, and are shipping ore.

Idaho

Boise County

Gold Hill—The company, E. E. Carter, manager, is arranging for leases on its surface workings, the ore to be treated in the Iowa mill. A power line is to be installed and machinery driven by electric power from the Payette river. Tests have proved that the ores can be cyanided with advantage.

Last Chance—The Columbia Mining Company operating this mine in the Quartzbury district has made a rich strike in the lower adit.

Shoshone County

Amy Group—T. W. Hunt and a number of Eastern associates are negotiating at present for the purchase of this group of claims on the west side of Pine creek. The price is said to be $25,000. The property has been extensively developed and one foot of clean shipping ore and several feet of concentrating ore opened up.

Atlantic—After an idleness of from four to five years this company has been reorganized and has purchased a group of seven claims in Cedar creek. A force of men is at work.

Evolution—Two feet of solid galena has been encountered on the 290-ft. level of this property. The crosscut from the bottom of the shaft was run about 100 ft. when it intersected the vein which has been crosscut for a distance of about 40 ft. on its dip.

Federal Mining & Smelting Company—A dividend of 1½ per cent. has just been declared on the common stock of this company, and involves a distribution of $150,000, the capitalization in common stock being $10,000,000. This is the only dividend that has been paid on common stock since about this time last year. The total now paid on common stock since the incorporation of the company is $2,643,750. On its $20,000,000 of preferred stock the company has disbursed this year $630,000 and a total in all of $3,934,250.

Flagstaff—At the annual meeting of the stockholders of this company held in Wallace, the following officers and directors were elected: President, J. S. Thomas; vice-president, Joseph Cook; secretary-treasurer, F. T. Millichamp and directors C. G. Matthews and O. B. Wallace. A financial statement showed that the company has still 130,000 shares of treasury stock on hand. It is believed that a resumption of work will be made in the near future. Development of the company's property ceased about one month ago.

Gold Back—At a depth of about 100 ft. this company has encountered 18 in. of solid, shipping galena together with several feet of good milling ore. The claims of the company adjoin the Pilot mine on the north and the Cornucopia on the south.

Hecla—This company has declared a dividend for the month of December at the rate of 3c. a share. This is the 66th dividend declared by the company and involves the disbursement of $30,000 making the grand total paid out by the company $1,710,000 and the total for 1908, $190,000.

Hector—Contracts for 350 ft. of work have just been let on the property of this company. These contracts are for a 250-ft. crosscut to the north vein and 100 ft. of drifting on the south vein which has just been encountered. Bonds have been taken by the company on two adjoining claims.

Hugo—An orebody carrying copper and gold has been encountered in the property at a point 75 ft. from the portal of the upper tunnel where a 40-ft. winze had been sunk.

King Solomon—After having been closed for about six months work on this property has been resumed and a contract let for 200 ft. of work. It is believed that in about another 60 ft. the ledge will be encountered when the balance of the work will be taken out in drifting.

Lead Tariff—Frederick Burbidge, representing the mining interests of the Cœur d'Alenes, has placed in the hands of Chairman Payne of the congressional committee dealing with the tariff revision at Washington, D. C., a formal brief containing the protest of the operators of this district against any attempt to reduce the tariff on lead ores.

Montana-Standard—The development of this property has practically ceased for the winter. It is the intention to put a full force of men to work again in the early spring and to erect a concentrator.

Indiana

Warrick County

While drilling a test well for oil on the Barkley farm in the northern part of this county, the drill passed through four veins of coal, two of which are 7 ft. thick. The last one is 600 ft. below the surface, and coal brought up is said to resemble cannel coal. All the veins have good roofs. The discovery has aroused considerable interest and steps will be taken at once to develop the new field. Jesse Barkley, of Lynnville, owns the land.

Michigan

Copper

Isle Royal—The new shaft this company is sinking on the Baltic lode is down about 50 ft. in solid ground and sinking has been temporarily suspended while a concrete collar is put in. At shafts Nos. 4 and 6 the hoisting equipment will be ready to go into commission in the course of a few weeks.

Hancock—Drifts on the West Hancock lode which has been opened by means of crosscuts from the 9th, 10th, 11th, and 13th levels of No. 1 shaft are breasted in fine copper-bearing ground. No. 2 shaft will cut this lode at a depth of about 2000 ft. The working crosscut from the 13th level of this shaft will connect with No. 1.

Winona—Operations at No. 3 shaft of this property have been temporarily suspended and the working force transferred to No. 4; No. 3 shaft has been opened to the 15th level and it is now planned to center all activities at No. 4 and open this shaft in like manner, so that when stamping begins, which in all probability will be the coming spring, the company will have ample ground opened to maintain regular shipments. The lode opened at depth shows encouraging mineralization.

Atlantic—Section 16 shaft of this company is nearing the 20th level, and a crosscut from the 19th is entering the lode. Results will be awaited with interest as it is believed the shattered and disrupted condition found in the upper levels will be eliminated with depth.

Franklin—Drifting from the 24th level of this company shaft on the Pewabic lode is under way, and the same richness that was opened in the level above is in evidence. At the 23d level a stope 20 ft. high and about 75 ft. long has been cut the full width of the vein, which averages about 12 ft.; the mineralization is equal to any yet found on this formation.

Osceola—No. 4 shaft of the North Kearsarge branch of this property will soon be in shape to begin producing. The surface equipment will be ready as soon as the underground openings are sufficient to maintain steady shipments. The shaft house is ready for sheathing and the machinery is being erected at the hoisting and compressor plants. The shaft will command the ground tributary to the southern boundaries of the Ahmeek and Allouez properties, and is opening a most encouraging copper-bearing belt. This tract carries the outcropping of the Kearsarge lode.

Keweenaw—The lower levels of the company's shaft are revealing a much better grade of rock. At the 11th level a fissure vein was encountered, and drifting on this is under way with a fine copper showing.

Phoenix Mill—The plant continues operating one shift a day; with the improve-

ments inaugurated some time ago more satisfactory results are obtained.

Mass Consolidated—At the close of the year 1907 the company had net cash assets, over and above all indebtedness, of $94,000. This has been reduced by about $35,000 as the result of operations in 1908. The average monthly loss during 1908 was, therefore, $3000, although in the months of November and December the mine made a little money over and above all expenses. Of the small deficit in 1908 at least $25,000 represents the cost of diamond-drill explorations. The company will not be in the immediate need of funds, and if the metal market should advance from its present level the mine should be able to work out a small net profit. At one time during the year the company was carrying about a six months' supply of copper, or 750,000 lb., against which it was borrowing $100,000. At the present time this supply has been reduced to about 600,000 lb., while the borrowings have been reduced from $100,000 to $65,000. The present output is about 150,000 lb. of refined copper monthly.

Montana

Butte District

Butte & London—The annual meeting of stockholders will be held at Butte on Jan. 19. Directors will be elected for the present year and the policy of the company will be determined.

Jefferson County

Butte & Corbin Company—At a meeting of directors held at Butte this week, Lee Bever was elected president, Lee Williams, vice-president, and J. P. Fitzpatrick, secretary and treasurer. The company's property is located in the Corbin district and has been developed by a tunnel 300 ft. long.

Broadwater County

Keating Gold Mining Company—At a meeting of stockholders, J. B. Roote, James A. McKee, C. C. Willis, W. R. Kirk, and C. S. Blackiston were elected directors for the year. Mr. Roote was elected president to succeed A. P. Nipgen, resigned, and Mr. McKee was elected vice-president. C. C. Willis will be assistant superintendant. The management states that since the commencement of operations by the company last July the gross smelter returns on ore shipped has amounted to $82,542.

Carbon County

Bear Creek District—Since the sale of a large tract of coal lands to Thomas Ryan two weeks ago there has been much activity in the location of coal lands in the district. Within the last 10 days all of sections 22 and 26, and the greater part of sections 29, 30, 31, 32, 34, 35 and 35 have been located.

Nevada

Esmeralda County—Goldfield

Consolidated Red Top Lease—This lease on the Red Top claim of the Goldfield Consolidated company, has developed some high-grade ore in the south drift on 225-ft. level. The orebody, which was only a narrow talc seam where first found, has gradually increased to a width of 18 in.; the ore is a sulphide, showing considerable rusty gold. Eighty sacks of high-grade ore have been saved.

Daisy Florence Lease—This lease, operated by Mitchell & Fairfield, recently encountered ore in a raise from the 315-ft. level. Returns from the first shipment of 30 tons gave a value of $75 per ton. The raise is now 25 ft. above the floor of the level and shows 4 ft. of quartz which assays $40 per ton after the high-grade ore has been sorted out.

Goldfield Kewanas—The vertical shaft is now 470 ft. deep, and at that depth a crosscut is being run to connect with the old incline shaft, which, although good shipping ore was found, had to be abandoned at a depth of 500 ft., because of a heavy flow of water. The crosscut, which is now 75 ft. long, will be continued 275 ft. farther; at that point a raise of 115 ft. will be driven to connect with the old shaft.

Kewanas Extension Mining Company—This company, leasing on the north end of the Kewanas No. 2 claim, is sinking with a view of cutting the Hazel vein, which should pass through its ground. The shaft is now 360 ft. deep.

Combined Mining and Leasing Company—The officers of this company have secured a new 18-months' lease on their old leasehold on the Velvet claim of the Goldfield Merger Company; this dates from Jan. 1, 1909. A contract for 200 ft. of crosscutting has been let.

Hazel Goldfield—The shaft, which cut an orebody at a depth of 720 ft., is being carried down on the vein. It is now 740 ft. deep, being the deepest lease shaft in this district. The orebody, which in places is 75 ft. wide, is of milling $8 grade, with bunches of high-grade ore in it that assays from $25 to $300 per ton. This is thought to be a continuation of the Red Top vein.

Grizzly Bear Lease—Work on this lease, which is on the Grizzly Bear claim of the Consolidated company, has been resumed, and the shaft, now 200 ft. deep, is being sunk at the rate of 3 ft. per day. A six-months' extension has been granted the lessees provided that the shaft is 800 ft. deep by Feb. 1, 1910.

Kansas City Goldfield Leasing Company—This company, which is operating the old Ricker lease on the Velvet claim, recently developed ore in a winze; this ore improves with depth; 10 tons are ready for shipment.

Goldfield Consolidated—The new 600-ton mill commenced operations Dec. 26, and is dropping 60 stamps, which number will be gradually increased by the end of January to the full capacity of 100 stamps.

Esmeralda County—Rawhide

Nugent Lease—The shaft is 100 ft. deep; on the 100-ft. level several crosscuts have been driven at this lease on the Coalition property. In one of the drifts a north-south shoot of ore was struck that assayed high in silver; the silver was found mostly in the talc which is about 2 ft. wide; some of this talc ore went as high as $700 a ton. On this lease there is another vein about 7 ft. wide that will average $16 per ton.

Victor Lease—On the 100-ft. level one of the walls of the vein is very well defined; the ore on this level is about 4 ft. wide, 1 ft. of it running several hundred dollars in gold to the ton. On the 200-ft. level the vein widens to 15 ft., and is nearly all quartz; the footwall is porphyry as on the 100-ft. level. The ore from a width of 15 ft. across the vein assays about $25 a ton; the 8 in. next to the walls is very rich. This lease is on the main vein of the camp; apparently, this vein is also the best carrier of gold in the district.

Truitt Lease—The shaft at this lease on Hooligan hill is 70 ft. deep. On the 70-ft. level several long drifts have been driven and much ore has been mined. From this level a winze 100 ft. deep has been sunk following the ore. Most of the mining now being done is on this, the 170-ft. level. Machine drills are used, and shipping ore is being taken out. The ore is barren looking, but much brecciated, and the seams are filled with oxidized material carrying gold; the rock as broken assays about $50 to the ton. The vein matter for a width of 40 ft. will probably pay to mill. The Truitt lease has shipped 700 tons.

Miller Lease—This lease is on Hooligan hill between the Victor and the Truitt leases, and is the highest upon the hill. The first level is the 65-ft.; on this level the incline shaft is connected with the vertical shaft which is 165 ft. deep. The incline shaft follows the ore, and is continued to the 165-ft. level, the deepest in the mine. The orebody in the incline shaft seems to be the main one, as from it all the shipments have been made. On the 165-ft. level drifts have been run in several directions, and in each one milling ore has been found that assays from $12 to $20 a ton. The main oreshoot still continues in the bottom of the incline shaft and is about 6 ft. wide. The formation is the same in this lease as in the Truitt, but the vein is more regular and better defined, more quartz being found on the lower levels.

Bradshaw Lease—In the prospect shaft, 50 ft. deep, at this lease on the east side of Ballon hill a rich vein of talc has been found. The owners have taken out

some ore assaying as high as $600 per ton.

Murray Lease—A rich strike has been made on the 200-ft. level of this lease on the Rawhide Consolidated property. The Murray 10-stamp mill which is being built by the Allis-Chalmers Company is rapidly nearing completion; it is to be ready by Feb. 15. The stamps weigh 1250 lb. each.

St. Ives Lease—A rich strike was recently made at this lease on Ballon hill by A. A. Codd and associates. On Jan. 3 the lease began shipping ore from the new strike.

EUREKA COUNTY—EUREKA

Windfall—J. J. Jones, of Goldfield, and associates who purchased this property last October for $200,000 are sinking a vertical, two-compartment shaft; this shaft is now 175 ft. deep. The company plans to build a 100-ton cyanide mill.

HUMBOLDT COUNTY—SEVEN TROUGHS

Wihuja Lease—Stoping is being done on the 265-ft. level, and sinking has been resumed from the 365-ft. point at which depth on account of a large flow of water sinking was stopped. The last lot of 150 tons from this lease returned $175 per ton.

Mazuma Hills—The shaft is being sunk, and considerable drifting is being done. The mill will be started this week.

English George Lease—All of the machinery for the Huntington mill to be erected on this lease, has reached Mazuma and work of construction is being rapidly pushed.

NYE COUNTY—TONOPAH

Production for the week ending Dec. 26 was 5183 tons having an estimated value of $129,575. The West End mined 150 tons; Tonopah Mining Company, 2950; Midway, 100; Montana Tonopah, 658; MacNamara, 325; Jim Butler, 300; Belmont, 700 tons.

Belmont—During the week ending Dec. 26, 130 feet of new ground was broken. Considerable development work is still being done in the upper levels, but this week most of the development was done on the 1000- and 1100-ft. levels.

West End—Development work is quite satisfactory; while stoping is being carried on in several places, no attempt is being made to produce a large tonnage. The week's work showed a marked improvement in the paystreak on the 400-ft. level.

NYE COUNTY—BULLFROG

Pioneer—The rich strike in this mine at Springdale, ten miles north of Bullfrog, is causing considerable excitement. The orebody which is 12 ft. wide is of good grade. The gold is rusty and is quite evenly disseminated throughout the quartz. The first shipment to Salt Lake City was made Jan. 1. The mine is now employing 40 men.

NYE COUNTY—BERLIN

Blue Bell—At this property only sufficient ore is being taken out to supply 20 stamps. This ore comes from a winze on the 125-ft. level. Work is being rushed on the 400-ft. level in order to get beneath this orebody; then the 30-stamp mill will be run at full capacity. On the 125-ft. level the vein varies from 4 to 15 ft. in width and is of good milling grade. The mill clean-up for November amounted to about $10,000 in bullion and $15,000 in concentrates. This company also owns the Downieville mine, 15 miles to the west; at present the company is negotiating the sale of that mine.

NYE COUNTY—HELENA

Broken Hills—Three hoists are now operating on this property, and two more, to be used on leases, are in transit. The last carload, consisting of 600 sacks, that was sent to the Western Ore Purchasing Company at Millers, gave returns of $122 per ton.

WHITE PINE COUNTY

Giroux—Control of this company has been secured by Cole & Ryan, which explains the recent rise in the stock.

Cumberland-Ely—A syndicate has been formed which has taken from the treasury of the Nevada Consolidated Copper Company the remaining 125,000 shares of Cumberland-Ely stock at not far from the present market price. The Nevada Consolidated sold the shares in order to finance an extension of the Steptoe smelter and mill. The Nevada Consolidated company originally owned 200,000 shares of Cumberland-Ely stock acquired in part payment when that company sold the Cumberland-Ely a one-half interest in the Steptoe reduction works for $3,000,000.

New Mexico

GRANT COUNTY—SYLVANITE

Sylvanite now has a full fledged post-office. Edwin J. Clark, one of the locators of the camp, has been appointed postmaster.

Wood Mine—Colorado capitalists headed by Jesse H. Waters, of Colorado Springs, president of the Midland Terminal and Florence & Cripple Creek railroads, have secured from the Pierson Brothers and W. E. Irwin a working bond and option on the Wood mine. Besides a substantial cash payment the vendors will receive shares in the company that is to be incorporated. Mr. Waters and associates also purchased the Ruth group of three claims on the eastern extension of the Clemmie vein. I. J. Russel, who sampled the mine for the purchasers, will have charge of the operations on both properties. A force of miners has been put to work.

Buchanan Group—Pierson Brothers & Irwin have bonded a group of six claims belonging to R. B. Buchanan, about a mile north of the Wood mine, for $40,000. Work of developing the new property will begin at once.

North Carolina

MONTGOMERY COUNTY

Iola Gold Mine—This mine has been sold by order of court to Capt. William Fleming, Waldorf-Astoria hotel, New York, for $50,000 cash. Capt. Fleming is well known as a director in several successful mines.

ROWAN COUNTY

Gold Hill Copper Mines—The sale of this mine in bankruptcy is ordered to take place Jan. 27. The property includes the large plant and several hundred acres of land. This is a well-known curb stock.

Tennessee

PUTNAM COUNTY

Georgia-Tennessee Phosphate Company—This company is now constructing a narrow-gage railway, half a mile long from its mines at Boma to a connection with the Tennessee Central Railroad. It is also putting in two 100-h.p. Walsh & Weidner, internal-fired boilers, and a hoisting engine, and will install a crusher with capacity of 500 tons per day.

Utah

BEAVER COUNTY

Newhouse Mines and Smelters—This company has a floating debt of $144,000. The company is producing 600,000 lb. of copper a month at a net profit of $20,000. New tables and machinery are being installed at the mill so as to increase the yearly output of the company to 12,000,000 lb. of copper.

Beaver Mine—The drift on the 700-ft. level has passed through the first oreshoot and now a raise is being driven in it. The 700-ft. level is being driven farther east, with indications of another oreshoot nearby.

SALT LAKE COUNTY—ALTA

Utah Mines Coalition Company—This company has filed articles of incorporation. The headquarters of the company are at Salt Lake. The capital is $1,250,000, in shares of $2.50 each, 250,000 shares remaining in the treasury. The officers are: Duncan MacVichie, president; James B. Risque, vice-president; Roland H. Strickland, secretary; Louis H. Farnsworth, treasurer. The property of the old Black Bess company and other patented claims near the head of Big and Little Cottonwood cañons have been taken over by the new company. There are four known veins in the property. One of these veins

has been developed to a depth of 350 ft. by shaft workings. The new company plans to drive an adit on the most northerly of the veins and to crosscut from this adit to the other lodes. This adit will be driven at a depth of 1000 ft. below the collar of the present shaft; its portal will be 75 feet above the level of Lake Solitude. From there a good wagon road extends to the railroad.

SALT LAKE COUNTY—BINGHAM

Bingham-Butte—Recently at a special meeting of the stockholders a bond issue of $200,000 was authorized. This issue will be secured by 400,000 shares of treasury stock and a mortgage on the property. Developments at the mine are promising. Part of the money raised by this issue is to be expended in purchasing nearby property.

SUMMIT COUNTY

Shipments—Shipments from the Park City mines amounted to 2108½ tons of lead ore during the week ending Dec. 26. The Daly-West shipped 750 tons; Silver King, 1069; Daly-Judge, 289½ tons. During the week ending Jan. 3 the Park City mines shipped 1769 tons of lead ore and 138 tons of zinc concentrates; the last from the Daly-Judge. The Silver King shipped 770 tons; Daly-West, 575; Daly-Judge, 279½; American Flag, 144½ tons.

Little Bell—The work has been resumed. At first this will be confined to the 300-ft. level as that is connected with the Quincy shaft of the Daly-West property through which the mine will be worked, and at present no attempt will be made to operate through the winze. Ed. Talbot, of the Daly-West mine, is in charge of the work at the Little Bell.

Silver King Coalition Company—One of the lawyers for this company is reported to have stated that the Silver King Coalition has refused and will refuse to deliver to F. A. Heinze ore claimed under the contract alleged to have been made several months ago. In the meantime the Heinze interests are putting the Majestic smelter at Milford in shape for operation.

West Virginia

MCDOWELL COUNTY

Pocahontas Consolidated—A second explosion on Jan. 12 wrecked the Lick Branch coal mine of this company at Switchback, killing 105 men. The mine had just been examined and declared safe by the State inspectors, and a force of 200 men had been put to work for the first time after the explosion of Dec. 28, when 50 miners lost their lives.

Philippine Islands

Benguet Consolidated Mining Company—This company's statement for October shows a production of 186 oz. gold and 150 oz. cyanide bullion. Work was stopped 10 days by a typhoon which caused a landslide breaking the flume and stopping the supply of water.

Paracale Gold Dredging Company—This company reports 630 oz. gold saved during the month of October.

Canada

ONTARIO-COBALT DISTRICT

Ore Shipments—Shipments of ore from Cobalt for the week ending Jan. 2 were as follows. Coniagas, 54,060 lb.; City of Cobalt, 67,090; Kerr Lake, 61,000; La Rose, 406,510; McKinley-Darragh, 114,000; Nipissing 258,210; O'Brien, 124,325; Temiskaming, 120,000; Trethewey, 249,000; Total 1,454,195 pounds.

Chambers-Ferland—At 120 ft. in No. 1 shaft a marked improvement has occurred in the vein, which shows at this point 18 in. of high-grade ore. In the west crosscut from No. 2 shaft at a distance of 219 ft. a deposit of low-grade ore showing calcite, niccolite and galena was encountered 8 ft. in width.

Little Nipissing—On the Peterson Lake lease a crosscut is being driven at 150 ft. toward the main vein. When this is reached drifting will be carried 50 ft. along the vein to cut a rich cross-vein which yielded rich ore at the 100-ft. level.

Rochester—The main shaft is down 170 ft. but progress in sinking has latterly been slow owing to water. This difficulty has now been overcome and the work is being pushed.

Silver Queen—Underground development is being undertaken on a large scale. Sixty-five men and 7 drills are at work on the 75- and 150-ft. levels, and about 3500 ft. of drifting and crosscutting have already been done. A new shaft is being put down to the south of the main workings and is now down 75 ft. A sump a few feet in depth will be sunk and a station cut. Several veins giving good indications will be worked from this shaft.

ONTARIO-MONTREAL RIVER DISTRICT

Otisse—A rich find is reported at a depth of 30 ft., where a surface vein has widened to between 12 and 18 in. and is yielding high-grade ore. A carload of ore is awaiting shipment.

Mexico

CHIHUAHUA

Tecolotes Y Anexas—The mill at Santa Barbara is treating 800 tons daily. About 40,000 tons of zinc middlings are impounded about the mill and a plant for the treatment of this product is planned. Ore bins of 5000 tons capacity have been constructed at the mines, which will be connected with the mill by an aërial tram to be in operation May 10. The picking belts will be removed to the mines and only sorted ore sent to the mill.

Las Cuadras—This property, three miles north of Santa Barbara has been taken over by C. M. Dobson, the former manager. The work of retimbering the main shaft has proceeded below the 400-ft. level, and trial shipments from the dumps to the smelter have been begun.

Rio Plata—The cyanide plant near Guazapares is expected to be ready for operation in February.

Gibraltar—A strike of rich ore is reported in this property in the Naica camp.

JALISCO

Jalisco Exploration—Ore carrying gold and silver has been encountered east of the Cinco Minas in the Hostotipaquillo district. Thomas Henderson is in charge of operations.

MEXICO

Olvidado—This mine, at Zacualpan has shipped its third carload of high-grade ore to Toluca. The property is new and was opened six months ago. The ore shipped is the result of development work only.

Seguranza—This company, of San Luis Potosi, has begun the erection of a new 100-ton cyanide plant on the property at Zacualpan. The plant is to be completed within six months. Electric power is transmitted from Temascaltepec. The Seguranza is the old Coronas mine. Geo. A. Waddell, San Luis Potosi, is manager.

Carboncillo—A rich strike is reported from this property in the Zacualpan district.

OAXACA

Tehuantepec Silver Mines Company—This company, which owns the San Francisco mine, in Taviche has applied for a concession for the use of the water of the Arroyo De Exegea in Ocotlan. The power is to be used to operate a proposed stamp mill.

San Carlos—This property, at Taviche, which has been operating with a reduced force for the last seven months, resumed with a full complement of men on Jan. 10. Sinking and lateral development has been resumed.

Santa Catarina—The first clean-up from the new cyanide plant has been made with good results. Enough tailings have been stacked to keep the plant running many months.

Mascota—The Piocha adit has cut the principal vein on this property in the San Carlos district, after driving through 125 meters of diorite. The vein is large, mostly oxidized and of low grade, but carrying rich pockets.

SONORA

Greene-Cananea—The copper production for the month of December amounted to 3,450,000 pounds.

Metal, Mineral, Coal and Stock Markets

Current Prices, Market Conditions and Commercial Statistics of the Metals, Minerals and Mining Stocks

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

New York, Jan. 13—The coal trade in the West seems to have relapsed into dullness for a time, the little spurt of the last half of December having passed over for the present. Continued mild weather has had its influence in the cities and the demand for steam coal seems to have dropped off for the time. In Indiana and Illinois most of the mines are working only half time, and in Ohio the condition is hardly as good as that. Operators are hopeful, however, that the steam-coal demand will shortly improve. It must do so as business revives, since very few manufacturers are carrying large stocks.

The Seaboard bituminous trade is quiet. No business is doing through New England territory, and in New York and Pennsylvania there seems to be a lull in buying.

The anthracite trade is also dull with very little doing at the principal centers. The companies, however, are keeping up shipments steadily. There has been abundant rain throughout eastern Pennsylvania, so that the reservoirs are filling up, and delays caused at the mines by short water supply are gradually disappearing.

Coal Traffic Notes

Tonnage originating on Pennsylvania railroad lines east of Pittsburg and Erie, year to Jan. 4, 1908 and Jan. 2, 1909, in short tons:

	1908.	1909.	Changes.
Anthracite	24,707	477	D. 24,230
Bituminous	362,376	127,014	D. 235,362
Coke	69,845	63,128	D. 6,717
Total	456,928	190,619	D. 266,309

Daily average was 114,232 tons in 1908, and 95,310 tons this year.

Anthracite coal shipments from Buffalo by Lake for the full season were 3,297,460 long tons in 1907, and 3,249,207 in 1908; a decrease of 48,253 tons.

Anthracite shipments in December again showed an increase, the total being 5,827,938 long tons, an increase of 484,461 tons over December, 1907. For the 12 months ended Dec. 31 the shipments were, in long tons:

	1907.	1908.	Changes.
Reading	14,018,795	12,578,883	D. 1,439,912
Lehigh Valley	11,532,255	10,772,040	D. 760,215
N. J. Central	8,714,113	8,495,425	D. 218,688
Lackawanna	10,237,419	10,088,697	D. 148,722
Del. & Hudson	6,562,768	6,461,666	D. 101,102
Pennsylvania	6,203,271	6,019,457	D. 183,814
Erie	7,151,683	7,450,175	I. 298,492
N. Y., Ont. & West.	2,689,089	2,798,671	I. 109,582
Total	67,109,393	64,665,014	D. 2,444,379

Two companies showed increases in 1908—the Erie and the New York, Ontario & Western. The largest proportional decrease was on the Reading; the smallest on the Delaware, Lackawanna & Western. The total decrease was 3.6 per cent.

The coal tonnage originating on the lines of the Pennsylvania railroad east of Pittsburg and Erie for the full year was, in short tons:

	1907.	1908.	Changes.
Anthracite	5,691,983	5,216,075	D. 475,908
Bituminous	39,718,356	34,246,864	D. 5,471,492
Coke	13,047,593	7,298,866	D. 5,748,727
Total	58,457,932	46,761,805	D. 11,696,127

Decrease in anthracite, 8.4 per cent.; in bituminous, 13.8; in coke, 44.1; in the total tonnage, 20 per cent.

Receipts of domestic coal at Boston for the full year, reported by Chamber of Commerce:

	1907.	1908.	Changes.
Anthracite	2,053,328	1,776,401	D. 276,927
Bituminous	3,184,964	3,302,929	I. 117,965
Total	5,238,292	5,079,330	D. 158,962

Receipts of foreign coal—chiefly from Nova Scotia—in 1908 were about 360,000 tons.

Coal tonnage Chesapeake & Ohio Railway, five months, from July 1 to Nov. 30, short tons:

	Coal.	Coke.	Total.
New River	2,752,948	88,566	2,841,514
Kanawha	2,133,767	12,954	2,146,721
Kentucky	148,013	.....	148,013
Connecting lines	108,294	26,814	135,108
Total	5,143,022	128,334	5,271,356
Total, 1907	5,133,664	195,339	5,329,003

Deliveries in 1908 were: To points west of mines, 2,706,247 tons coal and 76,271 coke; points east, 626,928 tons coal and 42,063 coke; tidewater, 1,805,757 tons coal; anthracite to line points, 4088 tons.

New York

Anthracite

Jan. 13—The hard-coal market continues very dull. The few frosty days of last week gave some hope of improvement, but the cold did not last long enough to give any special impetus to the trade. Supplies continue very good, both of domestic and of small steam sizes. In fact it is reported that the anthracite companies are storing considerable quantities in their yards in New Jersey and Pennsylvania, to provide against any possible shortage next spring.

Schedule prices are $4.75 for broken, and $5 for egg, stove and chestnut. Small steam sizes are: Pea, $3.25@3.50; buckwheat No. 1, $2.35@2.50; buckwheat No. 2 or rice, $1.60@2; barley, $1.35@1.50; all f.o.b. New York harbor points.

Bituminous

It is always expected at this season that local trade will be light, as very little business is usually done in the first week in January. This year, however, it is unusually dull, coming on top of a long quiet period. The far East is taking no coal just now and the Sound very little. New York harbor business is practically dead for the present. In the absence of business, prices may be said to hold at $2.45@2.65, New York harbor, for good grades of Clearfield. All-rail business is moderate. Cars are plentiful, but transportation a little slow.

In the Coastwise trade little is doing, but vessels are also scarce and rates are about the same. From Philadelphia, we quote: Boston and Portland, 75c.; Salem, Lynn and Bath, 85c.; Newburyport, 95c.; Portsmouth, 80c.; Providence, New Bedford and the Sound, 60@65c. per ton.

Birmingham

Jan. 11—Coal operations in Alabama promise to be steady for some time. The distribution of convicts among the coal companies will bring about some development. Heretofore but two coal companies have been using convict labor, the Tennessee and the Sloss-Sheffield. The Pratt Consolidated Coal Company and the Bessemer Land and Improvement Company are also using that labor now. There is considerable free labor still to be had for the mine work in this State, and it is being taken up more and more. The demand for coal is steadily improving. The quotations are holding their own. The larger consumers of coal in the Southern territory, the railroads in particular, are requiring more coal every month.

Much coke is being used in this district. The Tennessee company has considerable coke stacked up in various parts of the district, but not too much when it is proposed a little later on to start up several furnaces.

Chicago

Jan. 12—Cold weather for the last five days has increased materially the demand for domestic coals, throughout Chicago territory. There is still much coal in the bins of retailers and consumers, however, owing to the mild weather of December and a lively market has not yet appeared. It does not seem likely to appear for sev-

eral days, unless the extreme cold of the Northwest, where the demand is active, should continue throughout the upper Mississippi valley. Conditions at present, however, are decidedly better for wholesalers than they have been for several weeks.

The weather, both by increasing demand and checking the movement of incoming supplies, has done away with most of the demurrage selling that has persistently shaded prices on western lump, smokeless and Hocking for the last two weeks. Illinois and Indiana coals bring: Lump and egg, $2@2.65; run-of-mine, $1.65@1.75, and screenings, $1.40@1.60. Smokeless is still in large supply for the demand, for the lower-priced kind, though Pocahontas and New River hold up well toward the standard prices of $3.65 for lump and $3.15 for run-of-mine. Hocking has a good demand, but large shipments, with standard price—$3.15 for 1¼-in. lump—cut 25c. in some sales. Youghiogheny is quiet at $3 for steam and $3.15 for gas ¾-in. lump.

Anthracite has shown activity for the first time, with cold weather, and all sizes are in good demand in city and country, with supplies large.

Cleveland

Jan. 12—The coal market is dull, owing to the mild weather, which still limits domestic demand, and to an apparent falling off in the demand for steam coal. Lump and run-of-mine from Ohio districts are exceedingly quiet. The recent activity in slack has subsided for the most part. Prices, however, have not changed.

Indianapolis

Jan. 11—Indiana coal operators say with confidence that the coal-mining industry will take on an improved condition from this time on. They base this on the reports of the resumption of large coal-consuming mills and the certainty of colder weather. The closing month of the year was light in tonnage output, but operators believe the new year will open up good demand.

The indications for an improvement in the Block Coal district are better now than for some time. The season up to this time has been the worst in the history of the district, due largely to the mild weather. The average of work has been about half-time, while in some mines it has been even less. A few mines in this district have worked almost every day, but these are mines that were fortunate in getting large municipal contracts in Chicago and other cities.

The Mine Workers' legislative committee has prepared a bill to be introduced in the Legislature covering apprenticeship of miners. The bill provides that anyone starting work in a mine should first be employed under the direction of a practical miner for two years, to become familiar with the machinery and the condition of the mines. This is similar to the provisions of the Pennsylvania law.

Pittsburg

Jan. 12—The high water in the past 10 days made the rivers navigable and resulted in the shipment of between 3,000,000 and 4,000,000 bush. to Cincinnati and other lower river points. Large operators have reaffirmed the price for both river and rail coal on the basis of $1.15 for mine-run. Slack is strong at 75c. All the mines in the Pittsburg district are being operated at about 60 per cent. of capacity.

Connellsville Coke—The market has been easier, prompt coke being offered at 15c. or more concession from contract prices, which remain at $2 for furnace and $2.25@2.40 for foundry. The *Courier* reports production in the Connellsville region for the week at 148,710 tons, and in the lower field at 103,348; a total of 252,058 tons. Shipments for the week aggregated 6944 cars distributed as follows: To Pittsburg district, 3115 cars; to points west of Pittsburg, 3171 cars; to points east of Connellsville, 658 cars.

Foreign Coal Trade

United States Coal Imports—Imports of coal and coke into the United States, 11 months ended Nov. 30, long tons:

	1907.	1908.	Changes.
Anthracite	6,901	16,483	I. 9,582
Bituminous	1,890,754	1,378,211	D. 512,543
Total coal	1,897,655	1,394,694	D. 502,961
Coke	121,963	119,647	D. 2,316

In 1908, Canada contributed 1,017,746 tons of coal and nearly all the coke; Australia, 310,875 tons of coal. Imports are chiefly on the Pacific coast.

United States Coal Exports—Exports of coal and coke from the United States, with coal sold to steamships in foreign trade, 11 months ended Nov. 30, long tons:

	1907.	1908.	Changes.
Anthracite	2,553,901	2,579,865	I. 25,964
Bituminous	9,591,815	8,371,046	D. 1,220,769
Total exports	12,145,716	10,950,911	D. 1,194,805
Steamer coal	5,250,173	5,490,720	I. 240,547
Total	17,395,889	16,441,631	D. 954,258
Coke	813,914	546,019	D. 267,895

In 1908, Canada took 2,540,289 tons anthracite and 6,064,677 tons bituminous; a total of 8,604,966 tons, or 78.6 per cent. of the total.

Welsh Coal Prices—Messrs. Hull, Blyth & Co., London and Cardiff, report current prices of coal as follows, on Jan. 2: Best Welsh steam, $3.48; second, $3.36; thirds, $3.24; dry coals, $3.60; best Monmouthshire, $3.18; seconds, $3.06; best small steam, $2.04; seconds, $1.74. All per long ton, f.o.b. shipping port.

Iron Trade Review

New York, Jan. 13—The first two weeks of 1909 in the iron and steel trades have been marked by almost absolute dullness. Buyers probably are not yet through taking stock and are still uncertain as to the demand for finished products. At any rate there is evidence of a waiting market; the only question is how long this may last.

In pig iron there is considerable inquiry, but it looks as if most of this was of a tentative character; so far it has resulted in few actual sales. Foundry iron is selling in small lots and orders are not numerous. In steel pig there is nothing doing with outside furnaces. There are inquiries for some basic iron, but no actual sales of importance.

In finished material conditions are also quiet. Even structural steel remains dull for the present, no new contracts of any considerable size having been closed, although there are many projects under discussion and some have approached the stage of bids. The railroads are not yet ordering rails freely. The Pennsylvania order was expected to break the ice, but others are not following as yet.

In export trade it is reported that considerable business has been done in sheets, wire and wire products. There has been some talk of export orders for rails, but no actual business is reported. It may be noted that British makers have recently taken some large orders for South America which it was thought would be captured for this country.

Pig-iron Production—The reports from the blast furnaces, collected by the *Iron Age*, show that on Jan. 1 there were 220 stacks in blast, having an aggregate weekly capacity of 400,100 tons of pig iron; an increase of 20,000 tons over Dec. 1. Making allowance for the charcoal furnaces, we begin 1909 with production at the rate of 21,000,000 tons yearly.

Baltimore

Jan. 11—Exports for the first week in the year were light. The only important item was 4,534,800 lb. steel billets to Liverpool.

Birmingham

Jan. 11—Alabama manufacturers of pig iron are receiving some orders, though the buying this year has not yet opened up strong. The quotations remain firm at $13 per ton, No. 2 foundry, though 50c. per ton better has been asked. Some of the larger consumers have been making inquiry in the Birmingham territory for iron, ostensibly for second-quarter use and the sale of some 20,000 tons of iron, for eastern delivery, is announced. The cast-iron pipe people are preparing to lay in supplies, but for some reasons are not rushing the market.

The make is picking up a little in this section, though no furnaces were reported as going in blast during the past few days. The authoritative figures given out are to the effect that Alabama produced during 1908 something like 1,410,500 tons of iron, about 200,000 tons less than in 1907. The last month of the year was the best, the production going up to 146,803 tons against 86,036 tons in January.

At Ensley the Tennessee Coal, Iron and Railroad Company has acquired a large additional tract of land, and it is understood that structural iron and steel plants will be erected. The steel mill is in better operation now than it has been in some time. Efforts are being made to fill orders on hand, especially in steel rails.

Chicago

Jan. 12—The iron market continues quiet, purchases of pig iron and of finished materials being small in tonnage and not increasing materially in number from the holiday season. Prices remain firm, No. 2 Northern being sold at $17.50@18, and No. 2 Southern at $13@13.50 Birmingham ($17.35@17.85 Chicago) on first-half business. The demand for iron is scattered, some melters continuing to buy on short-time delivery, and others contracting for deliveries six months hence on a carefully conservative basis. Structural material, sheets, plates, bars and other iron and steel products are lagging in sales.

There are no evidences of weakness in the market and the quietness in pig iron is in part due to inventories by foundries and the making of changes which naturally come with the opening of the new year. Furnace agents do not display anxiety to hasten sales and profess faith in the gradual resumption of business.

Coke is somewhat dull and there is a tendency to ship in more than the market will stand. The price of coke remains $4.90@5 for the best Connellsville.

Cleveland

Jan. 12—The markets have been dull since the opening of the year, and little new business in iron and steel is noted in this territory. There is some inquiry for pig iron, but it has not resulted so far in orders of any importance, sales having been made chiefly in small lots.

Some increase is reported in shipments of ore from docks to furnaces. No action has been taken yet on the question of ore prices for the coming season.

Philadelphia

Jan. 13—Pipe iron and basic iron are engaging the attention of the market, but with only a moderate amount of business transacted during the week in this territory. While most consumers have only small quantities of iron in their yards, and not very much under contract for delivery, there is very little disposition to buy. Local makers are not receiving inquiries. Buyers who are accustomed to order far ahead are inclined to wait to see what is to be the probable outcome of tariff revision. Makers are not pushing iron on the market, and are renewing small contracts on former terms.

Steel Billets—No sales are reported. There is a rumor that quotations have been shaded, but no recent transaction corroborates them.

Bars—Buyers of bars are occasionally ordering enough to run them into April. Prices continue low.

Structural Material—The business is disappointing. Negotiations which started in December have not matured. Mill people say there is a general disposition to hold off. A lower level of quotations appear inevitable—on large contracts.

Scrap—Heavy steel scrap is snapped up wherever it is to be had, and at good prices. Some sales are being made daily of other kinds, but scrap dealers are obliged to hold the bulk of their incoming supplies, which they are confident they can get rid of in a few weeks at a good profit.

Pittsburg

Jan. 12—The iron and steel market seems to be reaching an interesting stage, as in some directions there is a heavy increase in the buying of finished steel products, while in others there has appeared severe cutting by some producers which, if continued, may force reductions in some products.

The most satisfactory accounts come from the wire trade, a prominent producer in this line reporting its business this week as at the heaviest rate for 14 months, and well distributed among the different lines of wire goods. As the wire trade touches more nearly the ultimate consumers, and the goods cover a wide range of consumers and practically the entire country, it is natural that the first evidences of reviving trade should come in this line, so that the showing is taken as foreshadowing a general improvement in the iron and steel trade as the new year progresses.

Pig Iron—There has been some improvement in inquiry, but sales have been very light. Furnaces are holding to prices firmly, although in some cases they are piling some iron. It develops that the purchases of basic by the Pittsburg Steel Company last month were larger than was then supposed, amounting to close to 20,000 tons, and covering the company for this quarter, with the iron it receives on the term contract made recently with the Penn Iron and Coal Company. The price paid was substantially $15.50, Valley, although a large part of the tonnage went through middlemen by the medium of coke deals. Another interest has been in the market for basic, and developed prices of $15.50, but latest reports are that it has not bought. Bessemer remains at $16.50, Valley, but is extremely quiet and the market is not strong. Foundry iron is held at $15.50@16, Valley, a number of furnaces not being willing to sell at the lower price. Forge is quoted at $14.50 Valley. Prices delivered Pittsburg are 90c. higher.

Steel—Shipments of billets and sheet-bars are up to the average maintained in the past two or three months, but are almost altogether on old contracts, there being scarcely and new buying. Prices remain on the basis of $25 for billets and $27.50 for sheet-bars, Pittsburg. Plates are nominally 1.60c., but are being shaded, particularly on the narrower sizes.

Sheets—Business in sheet is picking up and mill operations are maintained on about the same basis as last week. Black sheets are 2.50c. and galvanized sheets 3.55c., 28 gage, f.o.b. Pittsburg.

Foreign Trade in Iron and Steel

Iron and Steel Exports—Exports of iron and steel, including machinery, from the United States for the 11 months ended Nov. 30, are valued by the Bureau of Statistics of the Department of Commerce and Labor at $182,068,912 in 1907, and $138,881,761 in 1908; a decrease of $43,187,151, or 23.7 per cent. Leading items of export, in long tons:

	1907.	1908.	Changes.
Pig Iron	70,599	41,964	D. 28,635
Billets, ingots & blooms	74,831	104,284	I. 29,453
Bars	92,638	61,251	D. 31,387
Rails	318,143	186,167	D. 131,976
Sheets and plates	113,544	93,560	D. 19,984
Structural steel	129,041	106,943	D. 22,098
Wire	147,207	124,214	D. 22,993
Nails and spikes	53,493	34,130	D. 19,363

Considerable decreases are shown in all items except billets, ingots and blooms.

Iron and Steel Imports—Imports of iron and steel, including machinery, into the United States for the 11 months ended Nov. 30, were valued at $36,740,291 in 1907, and $18,247,668 in 1908; a decrease of $18,492,623, or 50.3 per cent. Leading items of import, in long tons:

	1907.	1908.	Changes.
Pig iron	478,448	81,872	D. 396,576
Scrap	26,516	4,029	D. 22,487
Ingots, blooms, etc.	18,441	9,009	D. 9,432
Bars	36,077	18,565	D. 17,512
Wire-rods	15,807	10,556	D. 5,251
Tinplates	56,231	56,015	D. 216

There were considerable decreases in all items except tinplates, in which there was little change.

Iron Ore Movement—Exports and imports of iron ore in the United States for the 11 months ended Nov. 30 are reported as follows, in long tons:

	1907.	1908.	Changes.
Exports	261,869	301,342	I. 39,473
Imports	1,149,129	652,559	D. 496,570

Imports of manganese ore for the 11 months, 188,526 tons in 1907, and 170,662 in 1908; a decrease of 17,864 tons.

Metal Markets

New York, Jan. 13—The metal markets generally have not been strong, and the first full weeks of the new year have been quiet, almost dull, in the character of their business.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal.	Exports.	Imports.	Excess.
Gold:			
Nov. 1908..	$ 2,967,795	$ 2,892,225	Exp. $ 75,570
" 1907..	615,169	63,574,871	Imp. 62,959,702
Year 1908..	73,857,749	45,105,993	Exp. 28,750,846
" 1907..	54,211,240	98,949,557	Imp. 44,738,317
Silver:			
Nov. 1908..	3,951,987	3,275,609	Exp. 676,378
" 1907..	4,187,378	3,602,405	" 584,973
Year 1908..	47,111,382	37,814,676	" 9,296,706
" 1907..	57,212,168	41,690,324	" 15,521,844

Exports of specie from New York, week ended Jan. 9: Gold, $5500, to Chile; silver, $908,400, to London and Paris. Imports: Gold, $178,615; silver, $89,457, from Cuba, Central and South America.

Gold—In London the price of gold on the open market has advanced, bar gold being quoted at 77s. 10⅞d. per oz., and American eagles 76s. 5⅞d. The Bank of France again took all the gold offered. Shipments of gold from New York this week were $3,500,000, making a total of $6,500,000 exported since Jan. 1, all to Paris.

Platinum—Dealers report business quiet, but that is usual at this season. Quotations are $24.25 for refined platinum, $26.25 for hard, and $20@21 for good scrap.

Our St. Petersburg correspondent reports under date of Dec. 24: In Ekaterinburg, the small miners and forestallers offer crude platinum, 83 per cent. pure, at 5 rubles 10 kopeks per zolotnik ($19.15 per oz.) The large dealers in St. Petersburg offer crude metal of the same grade at 19,900 to 20,000 rubles per pood, or about $19.56 per oz. St. Petersburg dealers are holding back in expectation of higher prices.

Silver—The silver market has experienced a sharp advance during the past week on buying by Chinese banks and Indian bazars. Spot silver in London has been scarce, causing a premium of ¼d. for prompt over future deliveries. The market closes steady at 24¼d. in London.

SILVER AND STERLING EXCHANGE.

Jan.	7	8	9	11	12	13
New York....	51⅛	51¼	51⅛	52⅛	52⅛	52⅝
London.....	23½	23½	23⅝	24 1/16	24 1/16	24⅛
Sterling Ex..	4.8695	4.8720	4.8720	4.8740	4.8750	4.8745

New York quotations, cents per ounce troy, fine silver; London, pence per ounce sterling silver, 0.925 fine.

Shipments of silver from London to the East, year to Dec. 31, reported by Messrs. Pixley & Abell, London:

	1907.	1908.	Changes.
India.....	£10,541,354	£9,274,390	D. £1,266,964
China.....	457,350	741,400	I. 284,050
Straits.....	691,150	164,885	D. 526,265
Total.....	£11,689,854	£10,180,675	D. £1,509,179

Receipts for the week, £5000 from Mexico and £195,000 from New York; total, £200,000. Exports, £1000 to Port Said, and £127,000 to India; £128,000 in all.

Copper, Tin, Lead and Zinc

Jan.	Copper. Lake, Cts. per lb.	Copper. Electrolytic, Cts. per lb.	Copper. London, £ per ton.	Tin. Cts. per lb.	Lead. Cts. per lb.	Spelter. New York, Cts. per lb.	Spelter. St. Louis, Cts. per lb.
7	14⅜ @14⅝	14⅛ @14⅜	63¼	28½	4.17½ @4.20	5.15 @5.20	5.00 @5.05
8	14⅜ @14⅝	14⅛ @14⅜	63	28¼	4.15 @4.20	5.15 @5.20	5.00 @5.05
9	14⅜ @14⅝	14⅛ @14⅜	....	28¼	4.15 @4.20	5.15 @5.20	5.00 @5.05
11	14⅜ @14⅝	14⅛ @14¼	62⅝	28	4.15 @4.20	5.12½ @5.17½	4.97½ @5.02½
12	14⅜ @14⅝	14⅛ @14¼	62¼	27¾	4.15 @4.20	5.12½ @5.17½	4.97½ @5.02½
13	14⅜ @14⅝	14 @14¼	62¼	28⅛	4.15 @4.20	5.12½ @5.17½	4.97½ @5.02½

London quotations are per long ton (2240 lb.) standard copper. The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis, New York, cash. The price of cathodes is usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—The reports from Europe have been rather discouraging and prices over there have given way from day to day. Foreign buyers have taken no interest whatsoever in the market, and domestic consumers could only be induced to place orders at concessions. A fair tonnage was sold at the decline. Lake shows less decline than electrolytic because there are fewer producers of that grade who have supplies that they are anxious to sell. The close is easy at 14⅜@14⅝c. for Lake copper; 14@14¼c. for electrolytic in ingots, cakes and wirebars. The average of the week at which business in casting copper has been done is 13¾@14 cents.

Copper sheets, cold-rolled, 20c.; hot-rolled 19c. per lb., base. Copper wire, 15¾c. base, carload lots at mill.

The London Standard market showed distinct weakness, prices crumbling away from day to day, and the close is easy at £62 2s. 6d. for spot, £63 for three months.

Refined and manufactured sorts we quote: English tough, £66; best selected, £65@66; strong sheets, £77@78.

Copper Producers' Association—At a meeting of copper producing, refining and selling interests in New York, Jan. 12, the report of the committee appointed at a previous meeting was received, and was adopted by the representatives present, subject to ratification by the companies. A provisional organization was effected, with the following officers: President, T. L. Livermore, Calumet & Hecla; secretary and statistician, L. C. Graton, at present with the United States Geological Survey; executive committee, Messrs. McLean, Broughton and Clendenning. The report adopted formulates the plan, which is to secure and compile reports of production and stocks on hand by the refiners, and such statistics as to the production of crude copper as may subsequently be deemed advisable; such reports to be made monthly and given out promptly, and, of course, to give totals only. The executive committee contains representatives of the three classes of members, viz., producers, refiners and sellers. It is expected that the statistical work will begin in February next. The first report will comprise a statement of the production of refined copper in 1908 and the stock on hand Jan. 1, 1909, probably.

Tin—The operators in the London market, who all along had been supporters of the market, turned around and became heavy sellers. It is difficult to tell what brought about this realization, but it may, on the one hand, be due to the unfavorable statistical position of the metal, or, on the other hand, to the impending Banka sale. At any rate, the market experienced a severe decline, and showed on Jan. 12, when it reached the lowest point, a maximum drop of over £5. At these lower prices some support became manifest, especially also from consumers on this side, in consequence of which the market rallied and closes firmer at £126 17s. 6d. for spot, £128 10s. for three months.

Sales, in this market were made at as low as 27¾c. but the close is firm at 28⅛ cents.

Lead—Consumers having covered their requirements for this month, the market has again become quite lifeless. The close is weak at 4.15@4.20c. New York, and 4.05c. St. Louis.

The London market is also again neglected and closes somewhat lower at £13 2s. 6d. for Spanish lead, £13 5s. for English lead.

Spelter—The market for this metal has been rather quiet throughout the week. But little spelter is pressed for sale as, on the one hand, producers are well supplied with orders, and, on the other, they have no margin in smelting the metal at the present prices for ore. The close is 5.12½@5.17½c. New York, 4.97½@5.02½c. St. Louis.

The London market has been firm throughout the week and closes higher at £21 7s. 6d. for good ordinaries, £21 12s. 6d. for specials.

Base price of sheet zinc is 7c. f.o.b. La Salle-Peru, Ill., less 8 per cent.

Other Metals

Antimony—The market continues quiet, with no material change in prices. Quotations are 8¼c. per lb. for Cookson's, 8⅛c. for Hallet's, and 7¾@8c. for ordinary brands.

Aluminum—No change is reported, and the market is quiet. The Aluminum Company of America quotes 24c. per lb. base for No. 1 ingots; 33@34c. base for sheets. Offers of foreign metal at 22c. are still reported, but sales are said to be small.

Nickel—Large lots, contract business, 40@45c. per lb. Retail, from 50c. for 2000-lb. lots up to 55c. for 500-lb. lots. These quotations are for spot nickel. The price for electrolytic is 5c. higher.

Quicksilver—New York prices are steady at $45@46 per flask of 75 lb., with a moderate trade. San Francisco quotations are $45 for domestic trade and $43 for export. The London price has been reduced to £8 7s. 6d. per flask.

Cadmium—In 100-lb. lots, 75c. per lb., at Cleveland, Ohio.

Magnesium—This metal is offered in New York at $1.25 per lb. in 100-lb. lots. The price is $1.40 per lb. for 5-lb. lots.

Imports and Exports of Metals

Exports and imports of metals in the United States for the 11 months ended Nov. 30 are reported as follows, in the measures usual in the trade:

Metals:	Exports.	Imports.	Excess.
Copper, long tons	279,561	84,775	Exp. 194,786
Copper, 1907....	197,452	106,681	Exp. 90,771
Tin, long tons....	206	33,105	Imp. 32,899
Tin, 1907.....	550	35,487	Imp. 34,937
Lead, short tons.	67,924	99,846	Imp. 31,922
Lead, 1907.....	47,481	72,137	Imp. 24,646
Spelter, sh. tons.	2,471	842	Exp. 1,629
Spelter, 1907....	493	1,768	Imp. 1,275
Nickel, lb.....	9,057,506	15,780,499	Imp. 6,722,993
Nickel, 1907....	8,221,889	17,081,281	Imp. 8,859,392
Antimony, lb.....	.....	7,542,997	Imp. 7,542,997
Antimony, 1907.	.....	7,870,411	Imp. 7,870,411
Platinum, oz.....	... .	38,857	Imp. 38,857
Platinum, 1907.	..... .	68,712	Imp. 68,712
Quicksilver, lb...	224,494	.....	Exp. 224,494
Quicksilver, '07	363,473	.....	Exp. 363,473
Aluminum, value	$309,738	.....	Exp. $309,738
Aluminum, 1907	299,588	.....	Exp. 299,588

Ores, etc.:	Exports.	Imports.	Excess.
Zinc oxide, lb.	22,056,313	.....	Exp.22,056,313
Zinc oxide, '07.	25,002,199	.....	Exp.25,002,199
Zinc dross, lb....	15,966,311	.....	Exp.15,966,311
Zinc dross, '07..	17,848,258	.....	Exp.17,848,258
Zinc ores, lg.tons	23,311	44,734	Imp. 21,423
Zinc ores, 1907.	16,011	.....	.....
Antim'y ores, lb.	.....	3,033,196	Imp. 3,033,196
Ant. ores, 1907.	.....	2,668,902	Imp. 2,668,902

Copper, lead and nickel include the metal contents of ores, matte, bullion, etc. The exports given include reëxports of foreign material. Zinc ores imported this year included 20,193 tons calamine and 24,541 tons other ores; in 1907 only partially reported.

Zinc and Lead Ore Markets

Platteville, Wis., Jan. 9—This week $41 per ton was the highest price paid for zinc ore; the base price was $40@41 per ton of 60 per cent. zinc. For 80 per cent. lead ore $48@50 per ton was paid.

SHIPMENTS, WEEK ENDED JAN. 9.

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Platteville.....	663,440	.....	149,400
Galena.....	264,000	.....	.....
Benton.....	242,480	.....	.....
Hazel Green.....	179,900	.....	.....
Strawbridge.....	88,000	.....	.....
Days Siding.....	88,000	.....	.....
Livingston.....	80,000	.....	.....
Rewey.....	66,000	.....	.....
Total.....	1,671,820	.....	149,400
Year to Jan. 9.....	4,449,426	.....	401,200

Highland, Linden, Harker and Mineral Point are not reported. There was shipped to the Platteville Separating Company 167,100 lb.; to the Joplin Separator Works, 70,000 lb. zinc ore.

Joplin, Mo., Jan. 9—The highest price reported paid was $44.50 per ton, the assay base price ranging from $40@43 per ton of 60 per cent. zinc. The latter price was bid today for next week's delivery. Silicate of zinc sold at $19@22 per ton of 40 per cent. zinc and the highest reported was $26. The average price, all grades, was $38.80 per ton. The highest price reported paid for lead ore was $52.50, the bulk of the ore selling at $52, with medium grades selling down to $50. The average price, all grades, was $50.78 per ton.

SHIPMENTS, WEEK ENDED JAN. 9.

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	4,534,100	373,470	$100,391
Joplin.....	2,034,370	275,160	48,859
Duenweg.....	1,038,560	39,140	21,788
Galena.....	749,950	29,990	16,779
Miami.....	541,300	309,850	16,716
Prosperity.....	788,120	16,410	16,188
Spurgeon.....	642,260	84,530	11,825
Alba-Neck.....	380,280	.....	7,605
Aurora.....	428,010	10,040	6,977
Carthage.....	342,540	.....	6,850
Oronogo.....	.....	288,800	6,738
Sarcoxie.....	201,360	.....	3,359
Quapaw.....	166,180	.....	2,991
Carl Junction.....	92,850	8,340	2,213
Badger.....	94,370	.....	1,934
Granby	158,000	4,000	1,846
Zincite.....	64,630	10,630	1,569
Cave Springs.....	72,300	.....	1,518
Wentworth.....	46,340	.....	589
Totals	12,375,520	1,450,360	$276,735
Two weeks.....	22,297,100	2,608,800	$495,656
Zinc value, the week,	$239,896;	2 weeks,	$429,872
Lead value, the week,	36,839;	2 weeks,	65,784

MONTHLY AVERAGE PRICES

Month.	Zinc Ore. Base Price.		Zinc Ore. All Ores.		Lead Ore. All Ores.	
	1907.	1908.	1907.	1908.	1907.	1908.
January.....	$46.90	$37.60	$45.84	$35.56	$83.58	$46.88
February....	48.30	36.63	47.11	34.92	84.58	49.72
March.....	49.75	36.19	48.66	34.19	82.75	49.90
April	49.25	35.40	48.24	34.08	79.76	52.47
May	46.90	34.19	45.98	33.39	79.56	56.05
June.....	47.00	33.06	44.82	32.07	73.66	60.48
July	46.80	34.55	45.79	31.67	58.18	59.90
August	44.56	36.53	43.22	33.42	59.54	60.34
September ..	41.00	37.63	40.11	34.44	53.52	54.59
October.....	41.75	35.95	39.83	33.28	51.40	52.63
November...	38.60	39.13	35.19	35.02	43.40	54.53
December...	31.50	42.75	30.87	39.63	37.71	49.68
Year.....	$44.36	$36.63	$43.68	$34.31	$68.90	$53.93

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

A cold wave, bringing almost zero weather, came Tuesday, closing down a number of mines for several days. In the Joplin field the gas company cut off the natural gas from all mines using it under boilers, and a number about Webb City had an insufficient supply to operate continuously. The result is that nearly all mines using natural gas under boilers have taken out the gas fixtures and ordered coal. The demand for coal was so great that it could not be shipped in fast enough to meet the increased consumption, on so short a notice. A careful estimate indicates about 10 per cent. reduction in output.

For the first two weeks in 1909, as compared with last year, there was an increase in value of nearly 100 per cent. on a 60 per cent. increase in shipment. The lead shipment was increased only 8 per cent. on account of so many producers holding this mineral for a higher market.

Chemicals

New York, Jan. 13—The market is steady, and trading is quiet. But little contract business is reported, but trade is coming fairly up to expectations.

Copper Sulphate—Prices are unchanged, and no shading is reported. Quotations are $4.75 per 100 lb. for carload lots, and up to $5 per 100 lb. for smaller parcels.

Arsenic—The market is sluggish. Quotations are 3⅛c. per lb. for white arsenic.

Nitrate of Soda—The position of nitrate in the United States Dec. 31 is reported as follows, in long tons, by Messrs. Mortimer & Wisner, New York:

	1907.	1908.	Changes
Stocks, Jan. 1.....	13,050	5,900	D. 7,150
Imports, 12 months....	304,245	278,650	D. 25,595
Total Supplies.....	317,295	284,550	D. 32,745
Deliveries, 12 months..	311,395	275,410	D. 35,985
Stocks, Dec. 31.....	5,900	9,140	I. 3,240
Afloat for U. S. ports....	68,300	83,200	I. 14,900

The quantities afloat include all cargoes due to arrive at United States ports by April 15 next.

Current quotations here are 2.17½c. for spot nitrate, and 2.15c. for futures.

Imports and Exports—The imports and exports of chemicals and raw materials in the United States 11 months ended Nov. 30 were as follows:

	Imports.	Exports.	Excess.
Copper sulph. lb.	.....	7,360,870	E. 7,360,870
Bleach, lb.....	66,622,981	121,511	I. 66,501,470
Potash salts, lb..	245,655,997	993,072	I. 244,662,925
Soda salts, lb....	10,388,753	772,147	I. 9,616,606
Acetate lime, lb.	.....	52,666,154	E. 52,666,154
Nit. of soda, tons	293,424	9,526	I. 283,898
Phosphates, tons	24,305	1,174,942	E. 1,150,637
Sulphur, tons....	17,884	23,073	E. 5,189
Pyrites, tons.....	621,315	.....	I. 621,315

Estimating sulphur contents of pyrites, the total sulphur imported was approximately 266,410 long tons.

Mining Stocks

New York, Jan. 13—The general stock markets this week were irregular, without any definite tendency, and weak rather

than strong. They were affected in different directions by various rumors, and to some extent by the steady outflow of gold to Europe. At the close a little stronger tone was manifest, chiefly because of a stronger feeling in the foreign exchanges.

The Curb market was also irregular and not particularly strong. The copper stocks were rather inclined to soften, on a moderate amount of selling. Other mining stocks were not in especial demand.

One sale of Homestake, of South Dakota, was reported, a small lot changing hands at $90 per share.

Boston, Jan. 12—Beginning the week with a rather irregular market, copper stocks steadied themselves and closed better. Superior mining became a leader in the trading today, advancing from $35.75 to $38.50, on sales of 3000 shares. Winona rose to $5.50, but Wyandot rose 50c., to $3.50 Wolverine gained $2.50, to $152; Copper Range sold at $78.50, with rally to $79.50; Atlantic rose to $18; Isle Royale to $25; Lake to $21.87½. Greene-Cananea sold freely at $11.50@12. North Butte held around $82, and Amalgamated sold between $81 and $82. The end was firm.

On the Curb business was generally good, but with no special feature.

It is reported that a new development company is to be organized to work a group known as the Live Oak, in the Globe district of Arizona. The company will probably be floated here.

STOCK QUOTATIONS

NEW YORK Jan. 12	
Name of Comp.	Clg.
Alaska Mine	‡⅜
Amalgamated	81⅛
Anaconda	48
Balaklala	‡2 1/16
British Col. Cop.	8⅜
Buffalo Mines	‡3⅛
Butte Coalition	26
Colonial Silver	7/16
Cum. Ely Mining	8¼
Davis Daly	3
Dominion Cop	7/16
Douglas Copper	2⅝
El Rayo	4
Florence	4 7/16
Foster Cobalt	.56
Furnace Creek	.10
Giroux	9
Gold Hill	⅜
Goldfield Con	8 1/16
Granby	‡108
Greene Gold	⅛
Greene G. & S	7
Greenw'r & D.Val.	‡.75
Guanajuato	2
Guggen. Exp.	180
Hanapah	.15
McKinley Dar.	1.01
Micmac	1⅜
Mines Co. of Am.	1
Mitchell Mining	⅛
Mont. Sho. C.	1
Nev. Utah M. & S.	2⅜
Newhouse M. & S.	‡5⅛
Nipissing Mines	10
Old Hundred	1/16
Silver Queen	.92
Stewart	⅜
Tennessee Cop'r.	45
Tri-Bullion	1/16
Union Copper	⅛
Utah Apex	5⅜
Utah Copper	44⅜
Yukon Gold	4 7/16

*Ex. Div. †Ex. Rights.

BOSTON Jan. 12	
Name of Comp.	Clg.
Adventure	9⅛
Allouez	‡37
Am. Zinc	24⅛
Arcadian	3
Arizona Com	36⅛
Atlantic	17⅞
Boston Con	16
Calumet & Ariz.	116
Calumet & Hecla	‡665
Centennial	32
Con. Mercur	.33
Copper Range	79
Daly-West	10½
East Butte	8
Franklin	15⅜
Greene—Can	11⅜
Isle Royal	25
La Salle	14¼
Mass	‡5⅜
Michigan	‡12½
Mohawk	69¼
Nevada	18½
North Butte	81½
Old Colony	‡.60*
Old Dominion	55¼
Osceola	‡131
Parrot	29
Quincy	93
Rhode Island	5¼
Santa Fe	2½
Shannon	16½
Superior	37½
Superior & Pitts.	16⅝
Tamarack	80
Trinity	15¼
United Cop., com.	14⅝
U. S. Oil	28
U. S. Smg. & Ref.	45
U.S.Sm. & Re.,pd.	46⅜
Utah Con	44½
Victoria	‡3⅜
Winona*	5½
Wolverine	152
Wyandotte	3¼

‡Last quotation.

N. Y. INDUSTRIAL	
Am. Agri. Chem.	36¼
Am. Smelt. & Ref.	84⅞
Am. Sm. & Ref. pf.	103¼
Colo. Fuel & Iron	40⅞
Federal M. & S.,pf.	81
National Lead	77
National Lead, pf.	‡105¾
Pittsburg Coal	‡13¼
Republic I. & S.	24½
Republic I. & S.,pf.	86¼
Sloss-Sheffield	78
Standard Oil	665
U. S. Steel	51⅞
U. S. Steel, pf	112⅜
Va. Car. Chem	43¾

BOSTON CURB	
Ahmeek	148
Black Mt	3
Chemung	22¾
Globe Con	7
Hancock	12
Helvetia	4¾
Keweenaw	5
North Lake	17⅛
Ojibway	14½
Superior & Bost.	16⅜

Furnished by Hornblower & Weeks, N. Y.

ST. LOUIS Jan. 9		
N. of Com.	High.	Low.
Adams	.40	.30
Am. Nettie	.08	.05
Center Cr'k	2.00	1.50
Cent. C. & C.	78.00	76.00
C.C. & C. pd.	82.00	80.00
Cent. Oil	110.00	100.00
Columbia	7.00	5.00
Con. Coal	22.00	20.00
Doe Run	125.00	110.00
Gra. Bimet.	.30	.20
St. Joe	15.00	13.00

LONDON Jan. 13	
Name of Com.	Clg.
Dolores	£1 10s 0d
Stratton'sInd.	0 3 3
Camp Bird	0 15 3
Esperanza	3 4 6
Tomboy	0 18 9
El Oro	1 5 7½
Oroville	0 9 0

Cabled through Wm. P. Bonbright & Co., N. Y.

NEVADA STOCKS. Jan. 13.
Furnished by Weir Bros. & Co., New York.

Name of Comp.	Clg.
COMSTOCK STOCKS	
Belcher	.48
Best & Belcher	.50
Caledonia	.26
Chollar	.22
Comstock	.25
Con. Cal. & Va	.80
Crown Point	.50
Exchequer	.40
Gould & Curry	.15
Hale & Norcross	.40
Mexican	1.00
Ophir	1.60
Overman	.22
Potosi	.16
Savage	.38
Sierra Nevada	.33
Union	.45
Utah	.06
Yellow Jacket	.80
TONOPAH STOCKS	
Belmont	.78
Extension	.50
Golden Anchor	.02
Jim Butler	.16
MacNamara	.34
Midway	.24
Montana	.68
North Star	.04
Tono'h Mine of N.	6.37½
West End Con	.35
GOLDFI'D STOCKS	
Adams	.03
Atlanta	.14
Booth	.25
Columbia Mt.	.17
Comb. Frac.	1.23
Con. Red Top	.11
Cracker Jack	.04
Dia'dfield B. B. C.	.09
Goldfield Belmont	.07
Goldfield Daisy	.64
Great Bend	.19
Jumbo Extension	.20
Kendall	.08
Lone Star	.06
May Queen	.04
N. Y. C. O. D.	.06
Oro	.11
Red Hill	.15
Roanoke	...
Sandstorm	.17

Name of Comp.	Clg.
Silver Pick	.10
St. Ives	.18
Triangle	.03
BULLFROG STOCKS	
Gibraltar	.03
Homestake King	.10
Mont. Shoshone C.	1.00
Tramp Cons	.09½
MISCELLANEOUS	
Bonnie Clare	.06
Lee Gold Grotto	...
Nevada Hills	1.50
Nevada Smelting	.87½
Nevada Wonder	.35
Nevada-Utah	2.75
Penn-Wyoming	.10
Pittsburgh S. Pk.	.85
Rawhide Coal	.70
Round Mt. Sphinx	.15

COLO. SPRINGS Jan. 8	
Name of Comp.	Clg.
Acacia	7¼
Black Bell	....
C. C. Con	‡3½
Dante	6
Doctor Jack Pot	8¾
Elkton	72¾
El Paso	52
Findlay	14¼
Gold Dollar	9¼
Gold Sovereign	‡3
Isabella	24¼
Index	....
Jennie Sample	16
Jerry Johnson	4¼
Mary McKinney	40
Pharmacist	‡3½
Portland	1.06
Un. Gold Mines	4¼
Vindicator	80
Work	7

Assessments

Company.	Delinq.	Sale.	Amt.
Andes, Nev	Jan. 8	Feb. 2	$0.10
Caledonia, Nev	Jan. 8	Jan. 29	0.05
Challenge, Nev	Dec. 11	Jan. 5	0.05
Chollar, Nev	Jan. 11	Feb. 3	0.10
Copper King, Ida	Dec. 10	Jan. 15	0.01
Ely Con., Nev	Nov. 28	Jan. 11	0.02
Exchequer, Nev	Dec. 30	Jan. 20	0.05
Federal-Ely, Utah	Jan. 9	Feb. 1	0.01
Iowa, Utah	Jan. 5	Feb. 2	0.02
Julia Con., Nev	Dec. 21	Jan. 15	0.03
Lower Mammoth, Utah	Dec. 18	Jan. 8	0.05
Mountain Dell	Dec. 24	Jan. 12	0.02
New York Con., Nev	Dec. 18	Jan. 8	0.03
Oro Cobre, Cal	Dec. 31	Jan. 16	0.02
Savage, Nev	Jan. 6	Jan. 28	0.10
Silver King Con., Utah	Jan. 6	Jan. 26	0.10
Union Con., Nev	Dec. 23	Jan. 14	0.10
Wabash, Utah	Jan. 7	Jan. 30	0.10
Yellow Jacket, Nev	Dec. 28	Feb. 3	0.15

Monthly Average Prices of Metals

SILVER

Month.	New York.		London.	
	1907.	1908.	1907.	1908.
January	68.673	55.678	31.769	25.738
February	68.835	56.000	31.852	25.855
March	67.519	55.365	31.325	25.570
April	65.462	54.505	30.253	25.133
May	65.971	52.795	30.471	24.377
June	67.090	53.663	30.893	24.760
July	68.144	53.115	31.366	24.514
August	68.745	51.683	31.637	23.858
September	67.792	51.720	31.313	23.877
October	62.435	51.431	28.863	23.725
November	58.677	49.647	27.154	22.933
December	54.565	48.769	25.362	22.493
Year	65.327	52.864	30.188	24.402

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

	NEW YORK.				LONDON.	
	Electrolytic		Lake.			
	1907.	1908.	1907.	1908.	1907.	1908.
January	24.404	13.726	24.825	13.901	106.739	62.386
February	24.869	12.905	25.236	13.098	107.356	58.786
March	25.065	12.704	25.560	12.875	106.594	58.761
April	24.224	12.743	25.260	12.928	98.625	58.331
May	24.048	12.598	25.072	12.788	102.375	57.387
June	21.665	12.675	24.140	12.877	97.272	57.842
July	22.130	12.702	21.923	12.933	95.016	57.989
August	18.356	13.462	19.255	13.639	79.679	60.500
September	15.565	13.388	16.047	13.600	68.375	60.338
October	13.169	13.354	13.551	13.646	60.717	60.139
November	13.391	14.130	13.870	14.386	61.226	63.417
December	13.163	14.111	13.393	14.411	60.113	62.943
Year	20.004	13.208	20.661	13.424	87.007	59.902

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

TIN AT NEW YORK

Month.	1907.	1908.	Month.	1907.	1908.
January	41.548	27.380	July	41.091	29.207
February	42.102	28.978	August	37.667	29.942
March	41.313	30.577	September	36.689	28.815
April	40.938	31.702	October	32.620	29.444
May	42.149	30.015	November	30.833	30.348
June	42.120	28.024	December	27.925	29.144
			Av. year	38.160	29.465

Prices are in cents per pound.

LEAD

Month.	New York.		London.	
	1907.	1908.	1907.	1908.
January	6.000	3.691	19.828	14.469
February	6.000	3.725	19.531	14.250
March	6.000	3.838	19.703	13.975
April	6.000	3.993	19.975	13.469
May	6.000	4.253	19.688	12.938
June	5.760	4.466	20.188	12.600
July	5.288	4.447	20.350	13.000
August	5.250	4.580	19.063	13.375
September	4.813	4.515	19.775	13.125
October	4.750	4.351	18.531	13.375
November	4.376	4.330	17.281	13.538
December	3.658	4.213	14.500	13.156
Year	5.325	4.200	19.034	13.439

New York, cents per pound. London, pounds sterling per long ton.

SPELTER

MONTH.	New York.		St. Louis.		London.	
	1907.	1908.	1907.	1908.	1907.	1908.
January	6.732	4.513	6.582	4.363	27.125	20.563
February	6.814	4.788	6.664	4.638	25.938	20.875
March	6.837	4.665	6.687	4.527	26.094	21.075
April	6.685	4.645	6.535	4.495	25.900	21.344
May	6.441	4.608	6.291	4.458	25.563	19.906
June	6.419	4.543	6.269	4.393	25.469	19.000
July	6.072	4.485	5.922	4.338	23.850	19.031
August	5.701	4.702	5.551	4.556	21.969	19.350
September	5.236	4.769	5.086	4.619	21.050	19.563
October	5.430	4.801	5.280	4.651	21.781	19.750
November	4.925	5.059	4.775	4.909	21.438	20.875
December	4.254	5.137	4.104	4.987	20.075	20.625
Year	5.962	4.726	5.812	4.578	23.771	20.163

New York and St. Louis, cents per pound. London in pounds sterling per long ton.

Mining and Metallurgical Companies—U. S.

Name of Company and Location.		Author-ized Capital	Shares. Issued.	Par Val.	Dividends. Total to Date.	Latest. Date.	Amt.
Alaska Mexican, g.	Al'ka	$1,000,000	180,000	$ 5	$2,040,381	Oct. 1908	$ .40
Alaska Treadwell,g.	Al'ka	5,000,000	200,000	25	10,235,000	Oct. 1908	.75
Alaska United, g.	Al'ka	1,000,000	180,200	5	423,420	Oct. 1908	.25
Amalgamated, c.	Mont	155,000,000	1,538,879	100	68,480,115	Nov. 1908	.50
Am.Sm.&Ref.,com.	U. S.	50,000,000	500,000	100	15,500,000	Jan. 1909	1.00
Am. Sm. & Ref. pf.	U. S.	50,000,000	500,000	100	29,750,000	Jan. 1909	1.75
Am. Smelters, pf. A	U. S.	17,000,000	170,000	100	3,455,000	Dec. 1908	1.50
Am. Smelters. pf. B	U. S.	30,000,000	300,000	100	5,250,000	Dec. 1908	1.25
Am.Zinc,Lead&Sm.	Kan.	3,750,000	80,000	25	280,000	Nov. 1907	.50
Anaconda,c.	Mont	30,000,000	1,200,000	25	43,650,000	Jan. 1909	.50
Arizona, c.	Ariz	3,775,000	3,682,520	.....	6,182,361	Apr. 1906	.05
Atlantic, c.	Mich	2,500,000	100,000	25	990,000	Feb. 1905	.02
Bald Butte, g. s.	Mont	250,000	250,000	1	1,354,648	Oct. 1907	.04
Beck Tunnel, g.s.l.	Utah	100,000	1,000,000	0.10	675,000	Oct. 1907	.02
Bent'nM.&D.,pf.,l.z.	Wis.	600,000	196,607	1	10,949	Nov. 1908	.01½
Boston & Montana.	Mont	3,750,000	150,000	25	52,500,000	Nov. 1908	3.00
Bull.Beck.&Cham.g	Utah	1,000,000	100,000	10	2,728,400	July 1908	.10
Bunker Hill & Sull.	Ida	3,000,000	300,000	10	10,746,000	Jan. 1909	.25
Butte Coalition,c.s.	Mont	15,000,000	1,000,000	15	2,450,000	Dec. 1907	.15
Calumet & Arizonac	Ariz	2,500,000	200,000	10	10,300,000	Dec. 1908	1.00
Calumet & Hecla,c.	Mich	2,500,000	100,000	25	107,850,000	Dec. 1908	5.00
Camp Bird, g., s.	Colo	5,500,000	820,000	5	5,313,600	Nov. 1908	.24
Carisa, c.g.	Utah	500,000	500,000	1	55,000	Nov. 1906	.01
Colorado, l. g. s.	Utah	200,000	1,000,000	0.20	1,020,000	Nov. 1908	.03
Columbus Con. c.	Utah	1,500,000	283,540	5	226,832	Oct. 1907	.20
Combi'tion Co.G'f'd	Nevada	400,000	320,000	1	688,000	Sept. 1906	.15
Con. Mercur, g.	Utah	1,000,000	1,000,000	1	3,385,313	Dec. 1906	.02½
Continental, z. l.	Mo.	550,000	22,000	25	231,000	Oct. 1908	.25
Copper Range Con.	Mich	40,000,000	384,185	100	7,683,700	Jan. 1909	1.00
Creede United, g.	Colo.	2,000,000	1,625,000	1	214,053	July 1906	.00½
Daly Judge, g. s. l.	Utah	300,000	300,000	1	225,000	Apr. 1907	.37½
Daly West, g. s. l.	Utah	3,600,000	180,000	20	5,877,000	Dec. 1907	.30
De Lamar, g. s	Ida	500,000	80,000	5	835,200	Sept. 1908	.24
Doctor Jack Pot.	Colo.	3,000,000	3,000,000	1	277,000	June 1906	.00½
Doe Run, l.	Mo.	10,000,000	59,062	100	1,765,005	Dec. 1908	1.50
Elkton Con., g.	Colo.	3,000,000	2,500,000	1	2,191,961	Nov. 1908	.01½
El Paso, g.	Colo.	2,500,000	2,450,000	1	1,315,545	Sept. 1908	.01
Fed. Sm., com.	Idaho	10,000,000	60,000	100	2,708,750	Jan. 1909	1.50
Federal Sm., pf.	Idaho	20,000,000	120,000	100	4,121,250	Dec. 1908	1.75
Findley, g.	Colo.	1,250,000	1,250,000	1	337,500	Sept. 1906	.01
Florence, g.	Nevada	1,250,000	1,050,000	1	420,000	Nov. 1908	.10
Frances-Mohawk,g	Nevada	1,000,000	910,000	1	546,000	Jan. 1908	.05
Gemini-Keystone	Utah	500,000	5,000	100	2,000,000	Aug. 1907	10.00
Gold King Con	Colo.	5,750,370	5,750,370	1	1,407,504	May 1905	.01
Goldfield Con., g.	Nevada	50,000,000	3,532,471	10	706,494	Nov. 1907	.10
Grand Central. g.	Utah	250,000	250,000	1	1,321,250	Dec. 1907	.04
Gwin Mine, Dev., g.	Cal	1,000,000	100,000	10	496,000	Apr. 1906	.05
Hecla, s. l.	Idaho	250,000	1,000,000	0.25	1,660,000	Oct. 1908	.02
Homestake, g.	S. D.	22,000,000	218,400	100	23,827,440	Jan. 1909	.50
HornSilver,g.s.c.z.l	Utah	10,000,000	400,000	25	5,642,000	Sept. 1907	.05
Imperial, c.	Ariz.	5,000,000	500,000	10	300,000	June 1907	.20
Inter'l Nickel, pf.	N. Y.	12,000,000	89,126	100	1,737,957	Feb. 1909	1.50
Iron Silver	Colo.	10,000,000	500,000	20	4,100,000	Oct. 1907	.10
Jamison, g.	Cal	3,900,000	390,000	10	331,500	Oct. 1908	.02
Jerry Johnson.	Cal	2,500,000	2,500,000	1	86,700	Jan. 1908	.01
Kendall, g.	Mont	2,500,000	500,000	5	1,275,000	Oct. 1908	.02
Liberty Bell,g. s.	Colo.	700,000	130,551	5	130,440	Jan. 1907	.15
Lightner, g.	Cal	125,000	102,255	1	253,081	Oct. 1906	.05
Lower Mammoth, g	Utah	190,000	190,000	1	57,000	Sept. 1907	.07½
Mammoth, g. s. l.	Utah	10,000,000	400,000	2.50	2,220,000	Mar. 1908	.05
Mary McKinney, g.	Colo.	2,500,000	1,309,252	1	841,093	Dec. 1908	.02
May Day, g. s. l.	Utah	800,000	800,000	1	108,000	Sept. 1908	.01½
Mohawk, c.	Mich	2,500,000	100,000	25	1,850,000	Feb. 1909	2.00
Mont. Ore Purch.	Mont	2,500,000	80,833	25	9,437,274	Jan. 1907	15.00
Nevada Hills, s.g.	Nevada	5,000,000	746,000	5	373,000	Dec. 1907	.10
New Century, z., l.	Mo.	300,000	300,000	1	213,000	Dec. 1906	.01
Newhouse M. & S.c.	Utah	6,000,000	600,000	10	300,000	Sept. 1907	.50
New Idria, q.	Cal	500,000	100,000	5	1,080,000	Jan. 1909	.30
New Jersey Zinc	U. S.	10,000,000	100,000	100	12,000,000	May 1908	4.00
North Butte	Mont	6,000,000	400,000	15	6,400,000	Dec. 1908	1.00
North Star, g.	Cal	2,500,000	250,000	10	1,911,988	Dec. 1908	.75
Old Dominion, c.	Ariz.	8,750,000	293,245	25	720,710	Dec. 1908	.50
OldDominion,M&Sc	Ariz.	5,000,000	162,000	25	364,500	Dec. 1908	1.00
Ophir, g. s	Nevada	604,800	201,600	3	1,816,360	May 1908	.10
Osceola, c.	Mich	2,500,000	96,150	25	7,227,950	July 1908	2.00
Parrot, c,s.	Mont	2,300,000	229,850	10	6,807,649	Sept. 1907	.25
Pennsylvania, g.	Cal	5,150,000	51,500	100	284,925	July 1905	.10
Pitts. L. & Z., l.z.	Mo	1,000,000	1,000,000	1	20,000	July 1907	.02
Portland, g.	Colo.	3,000,000	3,000,000	1	8,107,080	Oct. 1908	.04
Quartette, g. s.	Nevada	1,000,000	100,000	10	375,000	July 1907	.20
Quincy, c.	Mich	3,750,000	110,000	25	18,450,000	Dec. 1908	1.00
Rocco Homest'k,l.s	Nevada	300,000	300,000	1	112,000	Dec. 1905	.02
Sacramento, g, q.	Utah	1,000,000	1,000,000	1	255,000	Nov. 1906	.00½
St. Joseph, l.	Mo.	20,000,000	1,000,000	10	6,158,357	Dec. 1908	.15
Silver Hill, g. s	Nevada	108,000	108,000	1	81,000	June 1907	.05
Silver King, g. s. l†	Utah	3,000,000	150,000	20	11,187,500	July 1907	.33½
Silver King Co't'n.†	Utah	6,250,000	1,224,425	5	918,402	Jan. 1909	.30
Shannon, c.	Ariz.	3,000,000	300,000	10	450,000	July 1907	.50
Snowstorm, s. l.	Ida	1,500,000	1,500,000	1	600,000	Dec. 1908	.04
Standard Con., g. s.	Cal	2,000,000	178,394	10	5,194,130	Dec. 1908	.10
Stratton'sIndepend	Colo.	5,500,000	1,000,007	5	4,895,865	Apr. 1906	.12½
Swansea, g. s. l.	Utah	500,000	100,000	5	329,500	Mar. 1907	.05
Tamarack, c.	Mich	1,500,000	60,000	25	9,420,000	July 1907	4.00
Tennessee, c.	Tenn	5,000,000	200,000	25	2,056,250	Sept. 1908	1.25
Tomboy, g. s	Colo.	1,750,000	300,000	5	2,016,000	Dec. 1908	.48
Tonopah of Nev.	Nevada	1,000,000	1,000,000	1	4,250,000	Jan. 1909	.25
Tonopah Belmont.	Nevada	2,000,000	1,500,000	1	600,000	Apr. 1907	.10
Tonopah Ext'nsion	Nevada	1,000,000	928,433	1	283,030	Apr. 1906	.15
Tonopah Midway	Nevada	1,000,000	1,000,000	1	250,000	Jan. 1907	.05
Uncle Sam, g.s.l.	Utah	500,000	500,000	1	295,000	Dec. 1908	.02
United States, com.	Utah	37,500,000	350,933	50	1,798,099	Jan. 1909	.50
United States, pfd.*	Utah	37,500,000	485,845	50	4,881,377	Jan. 1909	.87½
United Cop. com.	Mont	75,000,000	450,000	100	5,962,500	Aug. 1907	1.75
United, c. pf	Mont	5,000,000	50,000	100	1,500,000	May 1907	3.00
United, z. l., pf	Mo.-Kan.	500,000	19,556	25	312,782	Jan. 1908	.50
United Verde, c.	Ariz.	3,000,000	300,000	10	20,610,322	Aug. 1908	.75
U.S. Red. & Ref. Pf.	Colo.	4,000,000	39,458	100	1,005,504	Oct. 1907	1.50
Utah, g.(Fish Sp'gs)	Utah	1,000,000	100,000	10	321,000	Nov. 1908	.08
Utah Con., c.	Utah	1,500,000	300,000	5	7,350,000	Jan. 1909	.50
Utah Copper	Utah	7,500,000	725,950	10	725,950	Dec. 1908	.50
Victoria, Utah	Utah	250,000	250,000	1	177,500	Mar. 1907	.04
Vindicator Con., g.	Colo.	1,500,000	1,500,000	1	1,980,000	Jan. 1909	.03
Wolverine, c.	Mich	1,500,000	60,000	25	5,100,000	Oct. 1908	5.00
Work, g.	Colo.	1,500,000	1,500,000	1	172,500	July 1908	.01
YankeeCon.	Utah	1,000,000	1,000,000	1	182,500	Jan. 1907	.03
Yellow Aster, g.	Cal	1,000,000	100,000	10	958,789	Aug. 1907	.20

*Previous to consolidation $1,436,250 were divided. †Amalgamated.

Coal, Iron and Other Industrials—United States

Name of Company and Location.		Author. ized Capital.	Shares. Issued.	Par Val. $	Dividends. Total to Date.	Latest. Date.	Amt.
Allis-Chalmers, pf.	U. S.	$25,000,000	161,500	100	$3,105,875	Feb. 1904	$1.75
Amer. Ag. Chem., pf.	U. S.	20,000,000	181,530	100	9,547,342	Oct. 1908	3.00
American Cement.	Pa.	2,000,000	200,000	10	1,288,000	Jan. 1909	.30
American Coal.	Md.	1,500,000	50,000	25	2,492,500	Sept. 1908	1.25
Bethlehem Steel, pf.	Pa.	15,000,000	150,000	100	900,000	Nov. 1906	.75
Cambria Steel	Pa.	50,000,000	900,000	50	8,775,000	Feb. 1908	.75
Central C. & C., com.	Mo.	5,125,000	51,250	100	2,536,875	Jan. 1909	1.50
Central C. & C., pf.	Mo.	1,875,000	18,750	100	1,453,125	Jan. 1909	1.25
Col. & Hock. C.& I.,pf.	Ohio	7,000,000	69,244	100	383,818	Apr. 1908	1.50
Consolidated Coal	Ill.	5,000,000	50,000	100	350,000	July 1904	1.00
Consolidation Coal	Md.	10,250,000	102,500	100	10,441,650	Jan. 1909	3.50
Crucible Steel, pf	Pa.	25,000,000	244,365	100	8,186,228	June 1907	1.50
Empire S. & I., pf.	N. J.	2,500,000	25,000	100	933,033	Jan. 1909	1.50
Fairmont Coal,	W. Va.	12,000,000	120,000	100	1,980,000	Jan. 1909	2.00
General Chem. Com.	U. S.	12,500,000	74,103	100	2,148,987	Dec. 1908	1.00
General Chem., pf.	U. S.	12,500,000	100,000	100	6,255,000	Jan. 1909	1.50
International Salt.	Penn.	30,000,000	182,280	100	911,400	Dec. 1906	1.00
Jeff. & Cl'f C. & I., cm.	Pa.	1,500,000	15,000	100	330,000	Aug. 1905	5.00
Jeff. & Cl'f. C. & I.,pf.	Pa.	1,500,000	15,000	100	862,500	Aug. 1908	2.50
Kern River Oil	Cal.	2,000,000	20,000	100	84,000	July 1908	.10
Lehigh Coal & Nav.	Pa.	19,113,000	382,260	50	*15,014,890	Nov. 1908	2.00
Maryland Coal,pf.	Md.	2,000,000	18,850	100	‡2,013,997	Dec. 1908	2.50
Monon R. Coal, pf.	Pa.	10,000,000	100,000	100	2,324,000	July 1908	3.50
NationalCarbon,com.	U. S.	5,500,000	55,000	100	715,000	Apr. 1908	1.00
National Carbon, pf.	U. S.	4,500,000	45,000	100	3,071,250	Nov. 1908	1.75
National Lead, com.	N. Y.	15,000,000	149,054	100	3,092,872	Jan. 1909	1.25
National Lead, pf.	N. Y.	15,000,000	149,040	100	17,894,248	Dec. 1908	1.75
Nat'l Steel & Wire,pf.	N. Y.	5,000,000	25,778	100	631,561	May 1906	1.75
New Central Coal	Md.	1,000,000	50,000	20	390,000	Nov. 1908	.40
New River Coal, pfd.	W. Va.	4,000,000	37,617	100	451,405	Nov. 1908	1.50
Pacific Coast Borax.	Cal.	2,000,000	19,000	100	2,086,500	Aug. 1905	1.00
Peerless Oil	Cal.	1,000,000	92,000	10	711,000	June 1908	.06
Penna. Salt.	Pa.	3,000,000	60,000	50	15,098,000	Oct. 1908	3.00
Penna. Steel, pfd.	Pa.	25,000,000	165,000	100	8,662,500	Nov. 1908	3.50
Phila. Gas, com	Pa.	36,000,000	664,800	50	*24,264,600	Feb. 1909	.75
Phila. Gas, pf.	Pa.	6,000,000	120,000	50	2,850,000	Sept. 1908	1.25
Pittsburg Coal, pf.	Pa.	32,000,000	297,010	100	11,434,962	Apr. 1905	1.75
Pocahontas C. C., pf.†	W. Va.	2,800,000	28,000	100	168,000	July 1908	3.00
Pocahontas C. C.,cm†	W. Va.	5,000,000	45,200	100	†406,800	Oct. 1908	3.00
Republic I. & S., pfd.	Ill.	25,000,000	204,169	100	5,045,338	Apr. 1908	1.75
Sloss-Sheffield, com.	Ala.	10,000,000	100,000	100	1,883,000	Dec. 1908	1.00
Sloss-Sheffield, pf.	Ala.	10,000,000	67,000	100	4,221,000	Jan. 1909	1.75
Standard Oil	U. S.	100,000,000	970,000	100	629,522,905	Dec. 1908	10.00
Tenn. C. & I., com.	Tenn.	22,553,600	225,536	100	3,583,060	Nov. 1907	1.00
Tenn. C. & I., pf.	Tenn.	248,000	2,480	100	390,040	Nov. 1907	2.00
Texas & Pacific Coal.	Texas	2,500,000	23,940	100	1,711,710	June 1908	1.00
United Metals Selling	U. S.	5,000,000	50,000	100	5,875,000	Jan. 1909	5.00
U. S. SteelCorp.,cm.,	U. S.	550,000,000	5,083,025	100	78,765,032	Dec. 1908	.50
U. S. Steel Corp., pf.	U. S.	360,281,100	3,602,811	100	218,975,274	Nov. 1908	1.75
Va. Carolina Ch., pf.	U. S.	20,000,000	180,000	100	14,340,869	Jan. 1909	2.00
Warwick I. & S.	U. S.	1,500,000	148,671	10	517,739	Nov. 1908	.30
Westmoreland Coal.	Pa.	3,000,000	60,000	50	8,880,000	Oct. 1908	2.50

*Since 1894. †Since 1907. ‡Since 1890.

Canada, Mexico, Central and South America.

Name of Company and Location.		Author-ized Capital.	Shares. Issued.	Par Val. $	Dividends. Total to Date.	Latest. Date.	Amt.
Amistad y Conc'rdia.	Mex.	$480,000	9,600	50	$417,070	Apr. 1908	$1.36
Batopilas	Mex.	9,000,000	446,268	20	† 55,784	Dec. 1907	.12½
British Columbia, c.	B. C.	3,000,000	503,000	5	201,200	Sept. 1907	.40
Buffalo, s.	Ont.	1,000,000	900,000	100	297,000	Jan. 1909	.06
Butters' Salvador, g.	Salv.	750,000	150,000	5	600,000	Apr. 1905	.25
Cobalt Central, s.	Ont.	5,000,000	4,761,500	1	95,230	Feb. 1909	.02
Coniagas (Cobalt)	Ont.	4,000,000	800,000	5	720,000	July 1908	.15
Consolidated M & S.	B. C.	5,500,000	53,552	100	781,885	Nov. 1907	1.25
Crow's Nest Pass	B. C.	4,000,000	160,000	25	2,018,648	July 1907	.62½
Crown Reserve, s.	Ont.	1,750,000	1,750,000	1	350,000	Jan. 1909	.16
Dolores, g. s.	Mex.	2,000,000	400,000	5	540,000	Feb. 1909	.15
Dominion Coal, com.	N. S.	15,000,000	150,000	100	3,150,000	Jan. 1909	1.00
Dominion Coal, pf.	N. S.	3,000,000	30,000	100	‡630,000	Feb. 1908	3.50
Dos Estrellas, g. s.	Mex.	150,000	300,000	0.50	3,480,000	Oct. 1908	.75
El Oro, g. s.	Mex.	5,750,000	1,080,000	5	4,989,600	July 1908	.36
Esperanza, s. g.	Mex.	2,275,000	455,000	5	9,222,400	Oct. 1908	.87½
Foster Cobalt, s.	Ont.	1,000,000	1,000,000	1	50,000	Jan. 1907	.05
Granby Con.	B. C.	15,000,000	135,000	100	3,508,630	Dec. 1908	2.00
Greene Con. Copper.	Mex.	8,640,000	864,000	10	6,137,800	Mar. 1907	.40
GreenGold-Silv'r,pfd.	Mex.	3,000,000	300,000	10	120,000	Mar. 1907	.40
Guanajuato	Mex.	3,000,000	540,000	5	74,250	Oct. 1906	.07
Guanajuato D., pfd. s	Mex.	1,000,000	10,000	100	30,000	July 1908	3.00
Guggenheim Expl.	Mex.	17,000,000	105,000	100	5,010,000	Jan. 1909	2.50
Hinds Con., g.s.c.l.	Mex.	5,000,000	5,000,000	1	100,000	Feb. 1908	.02
Kerr Lake, s.	Ont.	3,000,000	600,000	5	970,000	Mar. 1909	.20
La Rose Con., s.	Ont.	7,500,000	1,143,368	5	400,179	Jan. 1909	.20
LeRoi, Ltd., g.	B. C.	5,000,000	200,000	25	425,000	Dec. 1906	.48
LeRoi No. 2, g.	B. C.	3,000,000	120,000	25	831,600	July 1908	.48
McKinley-Darragh,s.	Ont.	2,500,000	2,000,000	1	480,000	Jan. 1909	.06
Mex. Con. M. & S. Co.	Mex.	2,500,000	240,000	10	660,000	Mar. 1908	.25
Mex.Mill.& Trans.pfd.	Mex.	2,000,000	12,000	100	35,450	Jan. 1908	3.00
Mines Co. of Am.	Mex.	2,000,000	2,000,000	1	3,425,000	Jan. 1909	.02
N. Y. & Hond. Ros.	C. A.	1,500,000	150,000	10	2,317,000	Dec. 1908	.10
Nipissing, s.	Ont.	6,000,000	1,200,000	5	2,340,000	Jan. 1909	.25
N. S. St. & Coal, com.	N. S.	5,000,000	49,876	100	1,087,856	Apr. 1908	1.50
N. S. St. & Coal, pf.	N. S.	1,080,000	10,800	100	458,350	Oct. 1908	2.00
Penoles*	Mex.	250,000	2,500	100	8,630,000	Dec. 1907	20.00
Peregrina, pfd. s.	Mex.	1,000,000	10,000	100	183,656	Sept. 1908	3.50
Pinguico, pfd. s.	Mex.	2,000,000	20,000	100	240,000	Oct. 1908	3.00
Platanillo	Mex.	500,000	206,989	1	5,580	Sept. 1906	.00
Reco, g. s.l	B. C.	1,000,000	958,000	1	327,082	Apr. 1906	.02
Securities Corp., pfd.	Mex.	200,000	2,000	100	42,699	July 1908	3.50
Silver Queen, s.	Ont.	1,500,000	1,500,000	1	345,000	Nov. 1908	.08
Temiskaming, s.	Ont.	2,500,000	2,500,000	1	375,000	Jan. 1909	.06
Tesuitlan Copper	Mex.	1,000,000	10,000	100	.....	July 1908	1.50
Tilt Cove, c.	N. F.	1,000,000	89,000	2	495,630	May 1908	.55
Tretheway, s.	Ont.	1,000,000	945,450	1	217,463	Dec. 1908	.10
Tyee, c.	B. C.	940,000	180,000	5	201,600	Aug. 1907	.36

*Mexican Currency. †Since reorganization. ‡Since August, 1905.

Industrials

Chalmers & Williams, Inc., advises that, among other large orders received, it has one for the Socorro mines, Silver City, New Mexico, for a 30-stamp cyanide mill, including 48-in. by 18-ft. tube mill and two 48-in. by 25-ft. Burt rapid cyanide filters.

Fairbanks, Morse & Company, of Seattle, Wash., through its mining department, has just sold an important reduction plant of its own design to the Skookum Copper Mining Company, of Roslyn, Wash. The equipment consists of approximately fifty tons of crushing, classifying, concentrating and transmission machinery for a complete installation of the most uptodate model for the economical reduction of the low-grade copper ores of the Skookum company, which operates in the famous Cle Elum mining district of the Cascade range. This sale seems to assure new life and activity in the mining industry for the section noted.

The Foos Gas Engine Company, of Springfield, Ohio, is furnishing a producer gas plant complete to the Standard Optical Company, for its new lens grinding department at Geneva, N. Y. The engine will be a 100-horsepower three-cylinder Foos vertical from which power will be transmitted by rope drive. The producer will use Pennsylvania anthracite and is so arranged that a portion of the gas will be drawn off and used for annealing furnaces. The plant will be a very complete one and will contribute materially to the economical operation of the factory. The Foos factory, at Springfield, has been working overtime for several months in the endeavor to keep up with orders.

During 1908 several articles describing the spiral feeder for pebble mills have appeared in the technical papers. While the patents in connection with the Hardinge Conical pebble mill were pending, Mr. Hardinge refrained from discussing the priority of the invention of the spiral feeder, but now Mr. Hardinge's patent for the device has been allowed and ordered to be issued. The patent papers show that application for patent was made in May, 1906—over 2½ years ago. Mr. Hardinge thinks that this antedates other spiral-feed patents. Even though the Hardinge invention is nearly three years old, the feeders that have been made since that time are not as complete for they are still without a reversible device which admits of their being run right or left handed.

The board of public works, of the city of San Francisco, has awarded the contract for the auxiliary water system, to the Byron Jackson Iron Works, of San Francisco, December 18, 1908. The contract price was $120,000. The contract comprises four sets of turbine pumps and steam turbines, to be installed on two fire boats. The capacity of each set to be not less than 2500 gal. per min., discharging against a pressure of 300 lb.; there are also eight pumping sets, or units to be located in stations on the shore. This will consist of eight turbine pumps and steam turbines, direct connected, each to have a capacity of 2700 gal. per min. when operating against 300 lb. pressure. The steam turbines will be capable of developing from 600 to 700 horsepower.

Oildag is a new lubricant introduced to mining engineers. Oildag is a combination of deflocculated, unctuous, Acheson graphite and oil. The graphite is so fine that it is practically molecular and a true lubricant in itself. It remains suspended in mineral oil, and is carried by the oil to the most intricate parts requiring lubrication. The graphite fills up all irregularities in the metal surfaces, giving them a veneer of graphite that greatly reduces friction. By so doing it increases the available power and greatly reduces the oil consumption, effecting a very marked economy in operation as well as maintenance. Oildag is a discovery of Edward G. Acheson, and is put up in tubes and cans sufficient for charging a specified quantity of mineral oil. The Acheson Oildag Company, of Niagara Falls, N. Y., are the manufacturers.

The Laidlaw-Dunn-Gordon Company has recently closed a contract with the Stewart-Kerbaugh-Shanley Company, for a large air compressor plant to be used in connection with its contract comprising some fourteen miles of the new Catskill mountain aqueduct to supply water for New York City. These compressors are to be of the motor-driven type, and are fitted with the well known Cincinnati air valve gear. It is intended that this equipment be of the highest possible design throughout, and the Stewart-Kerbaugh-Shanley Company in connection with the best engineering talent available, decided upon this type of plant, and the Laidlaw-Dunn-Gordon compressors as best adapted for their conditions. The matter of economy in operation, cost of maintenace and attention that the compressor equipment would require was the one important feature most considered; the matter of first cost being a secondary consideration throughout. This plant is similar in design to the two in operation by the United Engineering and Contracting Company, of New York City, and are similar in design to large compressor installations made by this company for S. Pearson & Son, Long Island City, and the Hudson Terminal Company, also of New York City.

The Industrial Instrument Company was organized by men who have long been engaged in the manufacture of measuring instruments. The leaders are B. B. Bristol, E. H. Bristol and W. E. Goodyear, all of Waterbury, Conn., who were for many years active in the development of the Bristol Company, and in the direction of its affairs during the time of its great development and success. The Industrial Instrument Company is a Connecticut corporation with authorized capital stock of $2,000,000. This company now owns the entire capital stock of the Standard Gauge Manufacturing Company, until recently, of Syracuse, N. Y., and of the Standard Electric Time Company, of Waterbury, Conn. The Standard Gauge Company will be incorporated in Connecticut. It has purchased a plant at Foxboro, Mass., into which it has moved from its outgrown quarters at Syracuse. The personnel of the organization includes instrument engineers of long experience, so that its engineering staff is capable of meeting successfully, demands for apparatus of a special nature for particular conditions so long as it falls within the company's scope. This engineering staff will continually be engaged in the development of those types of instruments necessary to complete the line planned by it. The sales end of the business will be carried on by the Industrial Instrument Company, of New York, which has recently been formed for this purpose. This company will handle the entire output of the Standard Gauge Manufacturing Company, and also the industrial branch of the business of the Standard Electric Time Company. Its officers are: President, Bennett B. Bristol; vice-president, Walter W. Patrick; secretary, Henry P. Dennis; treasurer, Arthur F. Mundy. It is the intention of the company to place on the market instruments as fast as they can be perfected and developed to a point where they can be considered worthy of the confidence and support of the engineering world. The broad purposes, solid principles, personnel, experience and financial strength of this unique instrument company seems to indicate for it a future of great progress and usefulness along its chosen line of activity. The home office will be located at Foxboro, Mass., with sales offices at 50 Church street, New York, and 752 Monadnock building, Chicago.

The "Schutte" precision electric motor-operated gate valve has distinctive features on which patents are pending. The hand wheel is a loose fit, has a vertical movement on the upper end of the yoke nut to which it is clutch-connected only when in its lowest or hand-operating position; this step-clutch is formed on the hand-wheel tub, around which there is a continuous rim, the latter engaging with the two extensions of a pivoted or hinged gear engaging clutch lever, the heavy end of which, when lowered, engages with a narrow lug on the inside of rim of the large spur gear also loosely mounted on the yoke nut below the clutch collar that carries the aforesaid hinged lever. As this hinged clutch lever and the lug on the inside rim of gear are both narrow, it follows that this gear can make about seven-eighths of a revolution for impact and for the purpose of allowing the motor to acquire speed. When the valve is used for motor operation the hand wheel is prevented from revolving and held in its highest or out-of-gear position by the two vertical lever-supported rods resting against the under side of the hand-wheel rim. From this it will be seen that the hand wheel is entirely cut out when the valve is being operated by motor, and can, therefore, exert no jamming action at the end of travel due to the stored-up inertia, nor does power have to be exerted to set it in motion even frictionally. The hand wheel and gearing, as described, interlock so that both cannot be out of action at the same time, nor can both be in action at the same time. When the hand wheel is in use the motor gearing is disengaged and *vice versa*—it is, therefore, "foolproof." As these valves are intended for operation from a distance, such as from a different floor where the operator at the reversing controller is unable to see in what position the gearing has been left, to insure that the gearing is left ready for emergency use, an instruction plate is provided on each arm of the yoke which reads: "Always leave valve ready for motor operation with hand wheel in highest position," the raising and lowering of the wheel being accomplished by means of a screw-spindle attached to a central lever on the rock shaft carrying the side levers that raise and lower the supporting rods. To cut the motor out at the proper time, two travel-limit switches are provided, one for the upward and one for the downward stroke; these close the circuit on a shunt trip coil in the controller so that the latter will be thrown to its off-position, thereby informing the operator that the valve has made its complete upward or downward travel as the case may be. In addition to this a double-pole circuit breaker is used to guard against burning out of motor or controller from overload. These valves find special application as an emergency shut off on steam mains between boiler and engine, or turbine rooms, and are made extremely massive, of the best material and workmanship. They are fitted with motors for either direct or alternating current of any standard voltage. To guard the threaded valve spindle from grit or dirt, and to insure a clean oiled surface, a protecting sleeve is screwed to the upper end of the hand-wheel hub. Motors are of special construction, fully incased, provided with self-oiling bearings, of large overload capacity and capable of standing the heat of high temperature steam to which the valves are subjected. As gravity is used to engage and disengage the motor gearing and keep the hand wheel in its lowest position, these valves must be used with spindle vertical and with mechanism on top as shown. They can, however, be fitted with a spring so that spindle can be used in a horizontal position and so that the valve can be used inverted. The valve is manufactured by Schutte & Koerting Company, Philadelphia, Penn.